AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 3, No. 5. WEEKLY. | NEW YORK, JANUARY 31, 1880. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

Double-Acting Cam-Drawing Press.

The engraving on this page represents a new double-acting cam-drawing press, which has just been produced, and is now being manufactured by Bliss & Williams, Plymouth and John Sts., Brooklyn, N. Y.

This press is used for the purpose of forming or drawing pans, such as wash-basins, bread-pans, and other small wares, each from a single sheet of tin. It consists of two upright columns joined to each other by a strong base which is mounted upon a suitable bed.

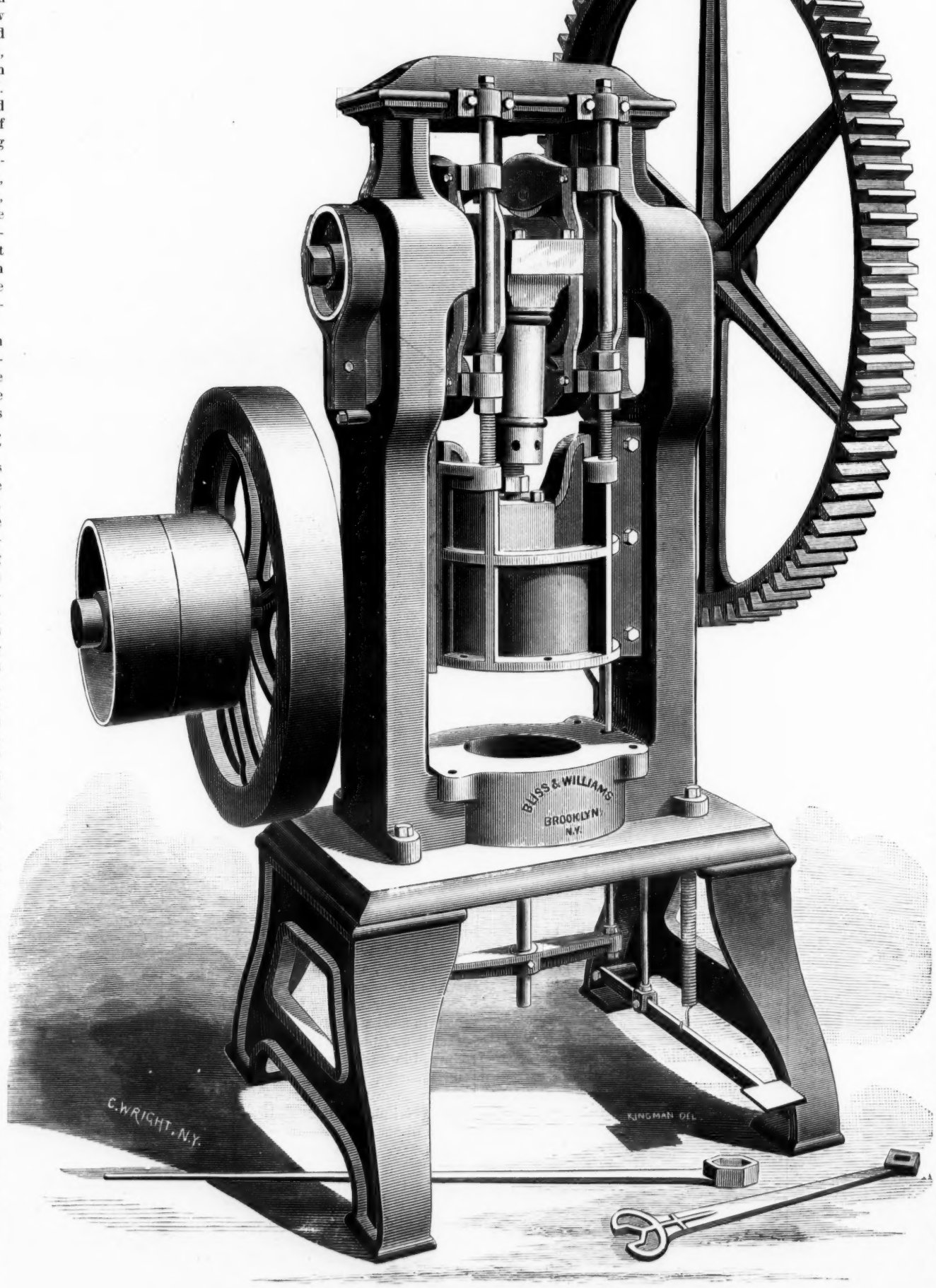
A steel shaft with journals 3¾″ diameter is located at the top; upon which are placed two steel cams of irregular shape, each having a face 3″ wide. These cams are fitted upon the oval or oblong shape, formed by the shape of the crank, the advantage of this being that the bearings can be brought nearer together, thereby avoiding the difficulties arising from springing of the shaft. In this case the crank is 6″ in length, and 3¾″ diameter. The two cams located on either side of the crank are 3″ wide, and the distance between the journals is only 14½″.

The lower part of the frame has an opening 24″, to the sides of which V guides are attached for a cylindrical cross-head. This cross-head is suspended from yokes placed upon the cams, by means of guide-rods, which are provided with threads and nuts by which the cross-head may be adjusted up or down. The yokes upon the cams are furnished with four steel rollers 4½″ in diameter, located at the top and bottom of each cam. These rollers are bushed with gun metal, and run upon steel pins.

The bottom flange of the cross-head has holes through it for holding the pressure plates. The solid cross-head for holding the stamping dies works in box-guides within the cylindrical cross-head. The latter is connected with the crank by means of an adjustable connection, which is simply a screw and jam nut. The lower end of this connection is a ball and socket joint, arranged to move freely without lost motion. If any lost motion does appear it can be readily taken up. This press is strongly geared, the diameter of the large gear being 60″, and the pinion 8″, which is as seven to one, and has a steel shaft 3″ diameter on the back part, upon which is placed a heavy fly-wheel 45″ in diameter, weighing 750 lbs. The tight and loose pulleys are 20″ diameter, and have a 6″ face. The operation of this press is as follows: The bottom die having been put in place, is held by four bolts, while the top die, which has a tapped hole in the center is firmly screwed upon a stud, which projects from the bottom of the cross-head. A pressure plate with an opening just allowing the solid die to pass through it, is then attached to the cylindrical cross-head, and a sheet of tin of the required dimensions is placed upon the bottom die. When the press is started the pressure plate quickly descends upon the tin, and holds it fast, when the solid die comes upon it, and draws the metal between the two surfaces. The pressure plate prevents the plate from pleating, and makes it form smoothly.

Straight-sided pans 14″ in diameter, and 4″ deep, may be formed at one operation upon this press, while wash-basins, and other irregular forms require two operations.

The machine will make from twenty to twenty-five strokes per



NEW DOUBLE-ACTING CAM-DRAWING PRESS.

minute. The stroke of the forming die on this machine is 8″, and that of the pressure plate 4″.

A noticeable feature about the machine illustrated is, that the irregular-shaped cams exactly fill the space between the rollers (located at the top and bottom) at all points of the stroke which allows no lost motion.

A brake is applied at the end of the crank-shaft as shown, in order that all the joints may be allowed to work freely without producing an unsteady motion, before the die touches the work placed under it. This brake is lined with leather to prevent wearing or cutting the parts.

A treadle placed under the machine is connected with an ingenious clutch, which is used for starting and stopping the machine. It is so arranged, that, when the press is started by pressing the foot upon the treadle, the die will make one stroke, and stop of itself at the upper end of the stroke.

This clutch consists of a piece of steel fitted into a half-round groove in the face of the journal, which is pivoted at each end. When the press is at rest this piece of steel forms a part of the journal, but when it is desired to start the press this piece of steel is rolled by a small arm, and forms a projection across the face of the journal, which engages a groove in the large wheel which is faced with steel.

When the stroke is completed, the small arm referred to comes in contact with a tripping device, which rolls the clutch back to its former position, thus stopping the press.

There are three points in the course of the stroke at which the clutch will take effect, thus saving the time which would be lost if only a single position could be used. The parts that are used in starting and stopping are cushioned by springs, so that most of the wear-and-tear, besides unnecessary noise, is thereby avoided. All parts are made to gauges, and the workmanship is characteristic of the well-known firm referred to.

A recent occurrence on the East River in New York Harbor, suggests the desirability of having an automatic pilot that will be apoplexy-proof.

Surface-Grinding Machine.

The accompanying cut shows the surface-grinding machine, referred to by Mr. Wm. Sellers in his address before the "Master Car Builders' Association," at their last meeting.

To insure an exact angle of 60° at the cutting point of the lathe tool, such tools are planed up to an exact size, and clamped in a V block, as is shown in the cut. This V block is then placed on one of the surface grinding machines. The projecting end of the tool is presented to an emery wheel, which revolves below the plate, and the edge of which, by adjustment of the plate, can be made to coincide with the surface of the plate, or be raised above the surface—care having been taken to make the sides of the V block true planes, standing at an angle of 60° one to the other.

The tool ground of such a holder has its end representing the extension of these true surfaces. Proper clearance may be given to the tool in grinding it, by underlying the V block with a wedge plate, made of the clearance angle beyond. The tool, when ground, as above shown, may then be topped off the required amount by planing the V block and tool still on plane in a vertical female V block, so arranged as to let the front of the tool be placed exactly vertical over the plane surface of the grinding machine; and the amount taken off for the flat required can be determined by the vernier gauge exhibited.

This is sufficiently accurate to make two sets of gauges, not hardened, and that interchanged with each other, in every case, at the first trial, and without dressing the threads in any way.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * If a man is engaged in the manufacture of spool thread, or nails, or hinges, or licorice drops, it don't seem to make much difference where he carries on his business. He never sees the consumer and never sells to him. His product is sold through numerous middle men, and probably he only needs two or three customers, anyhow. His goods are staple and are ordered by name and grade. A man wanting a dime's worth of lemon drops don't question into the manufacturing facilities of the several manufacturers, before he places his order. He don't have to go to the factory to confer as to the advisability of the adaptation of certain lemon drops to his special maw. He don't do anything, but go and buy from a dealer, who bought from a dealer, who bought from a dealer, etc.

The manufacturer of lemon drops finds that he can go off into the woods and squat by a cheap water-power, and a sugar mine, and a coal mine, and engage in business, and actually have a hundred economic advantages over his competitors in metropolitan centers. His freights are a trifle more, but his cheap water, coal, and sugar, will far overbalance the account. His traveler takes a full line of samples in a grip-sack, and the cost of selling is no greater than if he were in a city. He must, of necessity, under all circumstances, sell through representatives or factors.

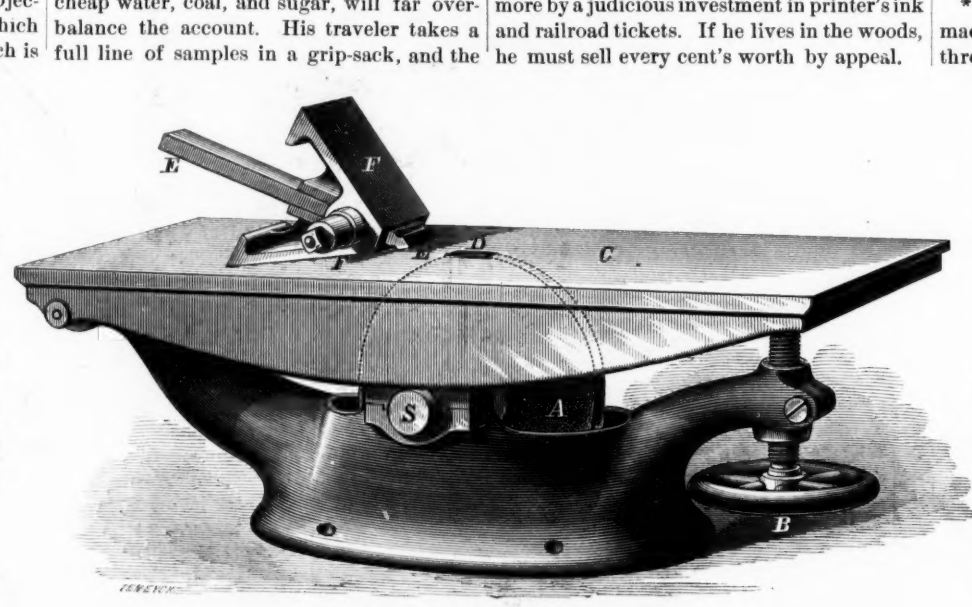
* * * * Suppose I take a notion to envy the man, who is situated among the hills with a coal mine in his front yard, and a water-power in his back yard, and a neighbor's iron pile handy. Suppose I manufacture wood-working machinery, and suppose I sit down and figure up how much I can save on power, fuel, and material in a year. Suppose these figures show a tip-top income in themselves—should I pack up, and move into this district myself? Would I make any money by it? Would I lose any by it?

* * * * As a builder of machinery, I would find it necessary to confer with at least one-third of my customers. They want to see what they are going to buy; they want to see the shop, and they want to see me. I travel around, and find men have bought of others, when the order would naturally have come to me. On inquiry and protest, I am told that "we didn't have time to go away up there. We can't step out of the business-world to buy things," etc., etc.

* * * * Manufacturing economies may sometimes be purchased at the expense of business. Go where orders can be filled cheaply, and the orders won't come—not always, of course, but often. A man who wants to buy a three-hundred-dollar machine is willing to go into a certain district and investigate, but he is unwilling and unable to go all over the country, or into inaccessible neighborhoods.

* * * * If a man has a factory in Boston, he is not moving out of reach when he goes to Chelsea. If in New York, Newark, and such places, are all right. Chester and Wilmington are the same to Philadelphia; Hamilton and Dayton the same to Cincinnati. But when a man moves from a metropolis, off to Smith's side track, a thousand miles from anywhere, and away beyond the jumping-off place, he will find that he makes a mistake, unless he is engaged in a business which does not require contact between producer and consumer. Customers don't know where the place is, don't know how to get there, haven't time to go there, and don't want to go there anyhow. Special friends will take the short cut and buy elsewhere. If a man is engaged in making things worth over a hundred dollars apiece, he had better "stay around," if he wants to sell them.

* * * * If a machine builder is unfortunate enough to find himself off somewhere where his customers can't and won't get at him, he must, of necessity, find some way to get at his customers. He finds, by fine calculation, that, by going to a tank station to start business, he saved thirty-five hundred dollars a year, and now he finds he must incur an expense of about five thousand dollars per year on account of extra "traveling and advertising." No matter where a man hangs his shingle, he must travel and advertise, of course. If ten customers run up against his premises accidentally, he can bring ninety more by a judicious investment in printer's ink and railroad tickets. If he lives in the woods, he must sell every cent's worth by appeal.



SURFACE GRINDING MACHINE.

Another way out of the difficulty is to sell through warehouses; and here I wish to express my earnest sympathy with a machine builder, who depends on a metropolitan agency for business, unless he happens to own the agency himself. In the latter case, he is o. k., and if a business can be made extensive enough, it looks like the right way to do it. Have the "concern" with a full stock in the city, and do the work anywhere. The disadvantage in this is, that freights are crossing and adding, and that the expense of down town warerooms and offices, and the expense of carrying complete stocks, and the expense of eternally running and telegraphing between office and works, four hundred miles distant, will often exceed the extra expense of having the whole business, shop and all, up town or in an accessible suburb.

* * * * When you depend on a general machinery agent for sales, you knock off a discount, but this is less than the cost of the sale, if you made it yourself. Your agent's salesmen may, and may not, be good. They may lie for, or against, your product.

Your factor may, or may not, keep your goods in good attractive condition. He may, or may not, possess the special knowledge required in suiting customers. He may treat you squarely, and he may hold your goods, to keep them from other factors, while he throws his influence in other directions, where better discounts may be had. Machinery agents have got as much human nature in them as other men. A man is wise to deal through them, but, I think, is unwise and unlucky, if his sole dependence is upon them. I apply this particularly to wood-working and iron-working-machinery.

* * * * For ready sales of machinery in these lines, there is nothing like having a good stock on hand. When a man takes a notion to buy a thing, he is much like a woman with a letter to mail. She may have put off writing the letter for several months, but when it is written, it must go into the mail *instanter*. If some man won't get out of bed to mail it, she will go through snow or rain herself. A man has decided to buy a tool. He has the money in his pocket, and starts for headquarters. If he don't find what he goes after, he gets on his ear. He can't and won't wait. He never dreamed of buying but from one builder, but if he fails there he will go where he can get instant satisfaction. He is bound to spend that money before he gets home. He won't be satisfied to leave an order. I have known a man to go nine hundred miles to buy a lathe, exactly twenty-four inches swing, and exactly twelve feet between centers; and with a certain kind of cross-feed, and certain other things to a dot. He wants this lathe, and must have it right away. He didn't find the lathe in stock, and came back with a little planer that he had no more use for than a diamond-pointed tool has for a side-pocket. He is just as well satisfied, however, for the money is gone. It's a good plan to keep something to sell to every man who comes after anything else.

* * * * There are certain classes of machines which are universally disposed of through factors. Among these are farm engines, and agricultural implements generally. I don't believe the shop sales to the consumer, under the most lavish system of traveling and advertising, can be brought to equal ten per cent. of the trade to be had through resident district factors. Farmers never have money or confidence enough to go far from home, and they don't understand the process of doing business by mail.

* * * * I have just been investing in a new lathe chuck. The shop has been full of common, independent chucks, scroll chucks, and Horton chucks. The independent chucks are generally substantial, well made, and indispensable. For ordinary boring, or, I might say, for almost all lathe work, the universal feature becomes desirable, and then a man wishes he didn't have an independent chuck.

If he has a universal chuck, everything goes along swimmingly, till something crooked, or square, or three-cornered, or finished work, or something else, awkward and inevitable, comes along, and then the universal chuck proves to be anything but universal, and a man wishes he didn't have that.

I have one chuck which is an independent nondescript, with a bevel pinion around the hub, gearing into each screw. This chuck is a fraud. The screws never have got done twisting. The scroll chuck is a cheap affair, and innocent looking, and it is innocent of any decided grip. They don't have the power for every-day work. A fifteen-inch chuck with an eighteen-inch lever will often fail to hold a job of ordinary depth. All the scroll chucks I have are made of cast iron at the lever sockets. The boys sometimes get exasperated at the things, and use a hammer on the levers to set the chuck tight. I never was able to stop the practice, and all the scroll chucks have been broken and banded with wrought iron. With the Horton chucks I never could find any fault, except that they didn't contain all the virtues of universal and independent movements. One nice thing about the Horton chuck is, that after a job is fairly chucked, each jaw may be slightly manipulated, and a finished job thus brought perfectly true. My new chuck is a Horton chuck, and is fixed to do just what I always wanted a Horton chuck to do.

The circular rack, instead of lying against a solid back, bears against three little seats, which can, by projections behind, be slid from behind the rack. This lets the rack leave the pinions, and the chuck becomes independent. It don't take a full second to make the change. A setting mark on the front allows the jaws to be set properly again. This simple plan of doubling the value of a valuable chuck, at an expense of

about ten cents, I should say, is the invention of Mr. Sweetland, and when he gets ready to trade new chucks for old ones, I want to know it. There are many good, universally independent chucks in the market now, but this one takes my eye for its simplicity.

* * * * Speaking of chucks, the Beach chuck seems to be the standard drill-chuck, but it certainly holds its place, on account of its magnificent workmanship. I have often been tempted to have a pin soldered on one, for a Sunday jewel. But I know when our men get hold of these elegant chucks, they can't make them hold a drill. I always was ashamed of the men, and thought they used these chucks severely, but when I went into nice New England shops, I found the Beach chucks hammered up the same as ours. This chuck pretends to be a hand chuck, when, in fact, a spanner must be made before work can be done. In the meantime, the chuck gets bruised up with sets and chisels, till its good looks are ruined forever.

* * * * Very respectfully,

CHORDAL.

Tool-Grinding Machine.

The use of emery wheels in machine shops, for grinding small tools, seems at the present day to have become as indispensable as the grindstone in our "grandfather's days." For common purposes an emery wheel attached to a spindle which is driven by a belt, seems to have met all requirements; this is, no doubt, for the rougher classes of work all that is necessary. But for grinding milling cutters and other tools which require the greatest exactness, something more is required. To meet this demand, the machine illustrated by Fig. 1 has been designed, and is now being manufactured with recent improvements by the Brown & Sharpe Mfg. Co., of Providence, R. I. It consists of a plain base and a square upright column (see Fig. 1), on the top of which is placed an arbor carrying two emery wheels. One of these wheels may be of fine and the other coarse emery, in order that the coarse wheel may be used for grinding tools, thereby greatly increasing the utility of the machine.

The arbor is made of steel which runs in boxes ground to a perfect fit; these bearings are self-lubricating, and are securely inclosed so as to exclude all emery and dust arising from the grinding operation. The jacket or covering also excludes all dirt from the belt and pulley. The adjustable slide-rest *a*, attached to the plate *b*, forms a support for the arbor *d*. This arbor has a tapered hole in the end for the purpose of inserting changeable centers or small mandrels *h*, which are necessary for holding small shell-reamers and mills, and other small or complicated tools for grinding. The arbor is securely held by a close-fitting sleeve *e*. This sleeve is provided with small longitudinal grooves in order that it may be turned by the operator. A set-screw placed in the slide-rest *a*, will hold the spindle firmly in any position as may be desired. A shell *e*, is fitted so as to slide upon the smaller parallel portion of the mandrel *d*, and is used for holding milling cutters. This sleeve is provided with collars to accommodate cutters of all widths.

In grinding milling-cutters it requires great accuracy in order to have all the cutting edges alike and having the same clearance. The cutter being placed upon the sleeve *e*, is then set in front of the large emery wheel so that it may be moved across the face. A tooth-rest *g*, is then placed in position as shown, and not only guides the cutter, but also serves as a gauge for the proper clearance. The reader will understand from this description that a cutter may be ground quite rapidly by moving it across the face of the wheel, and rotating it so as to cause every tooth to pass over the gauge successively. A holder *f*, graduated on the edge, can be applied as shown in Fig. 2, for the purpose of grinding spiral or bevel cutters. By means of the graduations the holder may be adjusted to suit all angles. The projection from the bottom of the holder *f*, has a slot in it, so that by loosening a nut on the end of the guide-rod it may be set to give the cutter the proper clearance. When it is desired to use the machine for grinding common tools the slide-rest may be removed and the plain-tool rests *i i*, put in place of it, and when not in use may be hung upon the column. This machine is furnished with a counter shaft with self-adjusting hangers and self-oiling boxes. Cutters may be ground on this machine as large as 4″ long and 5″ diameter.

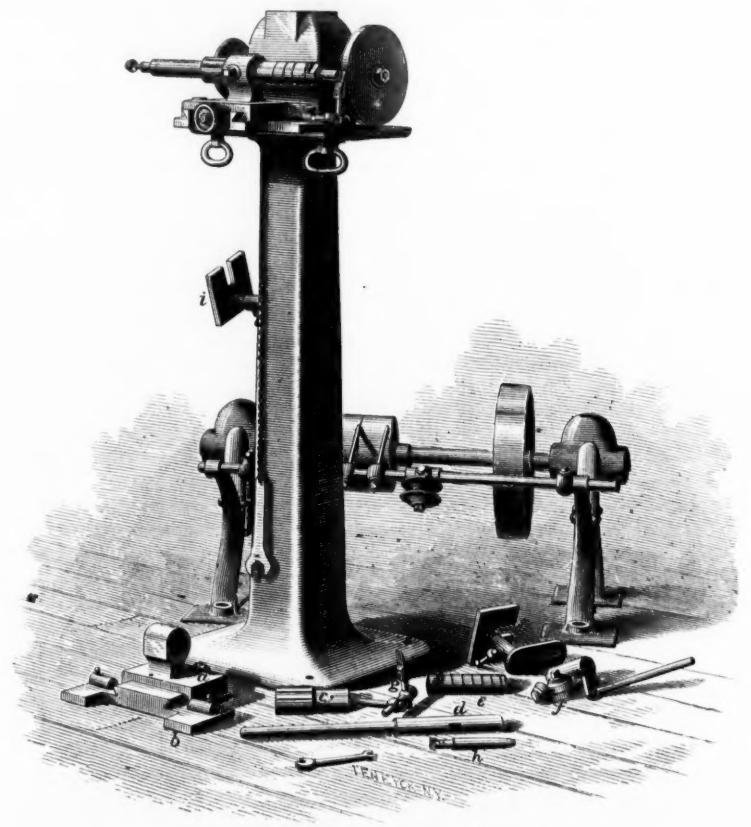


FIG. 1.—TOOL-GRINGING MACHING.

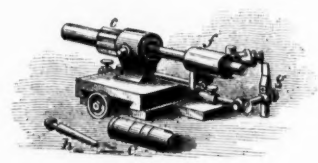


FIG. 2.

Machine Shop Regulations.

The following rules are those of R. Hoe & Co's extensive saw and printing press works in this city. Every workman and apprentice when entering the employ of this establishment is required to sign an agreement to work subject to these rules at all times and under all circumstances. It will be noticed that there are some peculiar features embodied.

1. No visitor is allowed to enter these works without a permit from the office, signed and dated on the day used, which permit is to be returned to the office on going out.

2. Every man and boy in entering these works accepts all the risks and dangers of the same. The firm will not be responsible for any injury that any one may receive on their premises, nor for any accident that may happen from any cause whatever to any one in their employ, wheresoever he may be

3. The workmen are employed by the hour and their time is taken every day.

4. Wages are paid on Monday for time up to previous Wednesday night; said wages being in full payment not only for work but for all risks, dangers and damages of whatever nature, and for all claims upon the firm of every description, except for unfinished piece work as hereafter specified.

5. Piece workers are paid weekly only their regular wages by the hour, on account, the overplus, if any on their work, being rendered them on its completion and approval by the firm. Any one dismissed or going away of his own accord forfeits all right to any such prospective profit, and the firm reserves to itself in all cases the right to discharge any one at any time.

6. Any error in wages must be reported in the office immediately, and no alleged error will be inquired into nor any claim allowed unless so reported within one week after the regular weekly payment in which the error may have occurred.

7. Each workman is furnished with ten checks bearing his shop number, one of which is to be left in the tool room for each tool or drawing taken out, or in delivery office on entering or leaving the shop during working hours.

8. The regular working hours either within or without the works, are from 7 till 12, and from 1 till 6 o'clock, except that on Saturday the day ends at 5 o'clock. During these hours the gate is closed, and entrance or exit is through the delivery office, where a check must be left. Night workers will be furnished by the foremen with tickets, which they will leave at the gate.

9. All workmen are expected to remain at their posts during working hours, and no apprentice is to leave his own department unless sent by his foreman.

10. Any one giving in wrong time or working for himself or for another during working-hours, or at any other time without permission, will be discharged.

11. Piece workers are not to call upon the laborers for help, except for heavy lifting, which they are unable to do among themselves.

12. Every tool and implement must be returned to its proper place by the person who has used it, and any injury to it, or to any of the machinery or buildings or other property of the firm, must be reported immediately.

13. All tools taken out of the works must be noted on a list furnished by the foreman, which is to be checked in the delivery office on going out and coming in.

14. Taking strong drink, reading newspapers, or washing up during working hours, or smoking on the premises at any time, are strictly forbidden.

Lost Power.

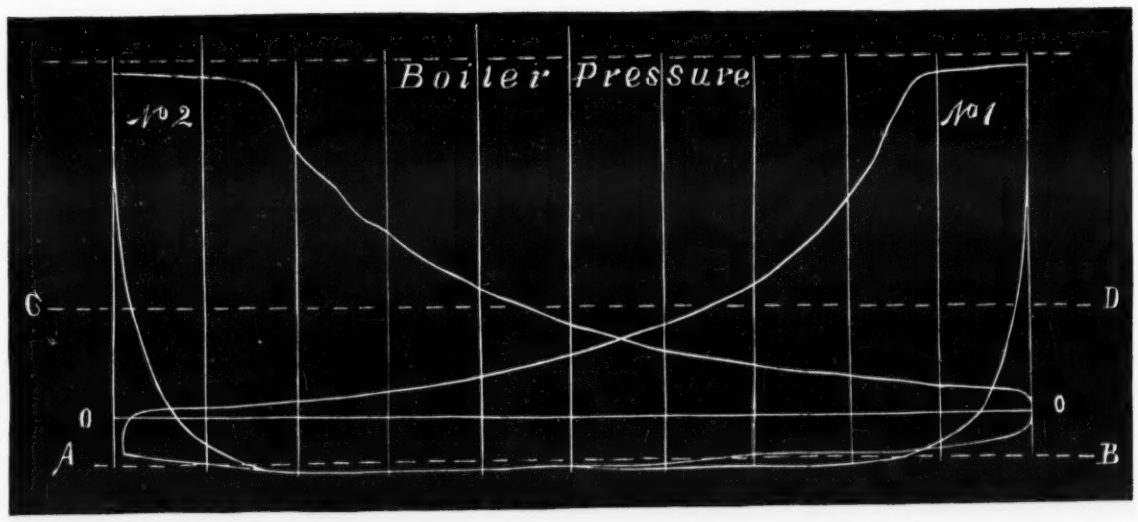
BY W. H. ODELL,

A set of indicator diagrams, taken simultaneously from each end of the cylinder of a steam engine, by the use of two indicators, are here exhibited; the object of the analysis being to show by the indicator the important part the fly-wheel of an engine takes in producing a uniform motion to the shafting machinery of a mill or factory.

The principal dimensions of the engine from which these diagrams were taken, are:

Cylinder 26″ dia. by 60″ stroke.
Width of fly pulley 40″.
Mean depth of rim of fly pulley 2.75″.
Dia. line of energy 238″.
Circumference 747.7″
Cross section of rim $((40 \times 2.75)) = 110''$;
Weight $((747.7 \times 2.75)) = 22{,}206.7$ lbs.
Revolutions per minute 50;
No. ft. traveled per minute,
$((747.7 \times 50 \div 12)) = 3115.4$;
Energy exerted per minute,
$((22{,}206.7 \times 3115.4)) = 69{,}182{,}753$ ft. lbs.

The dotted line *a*, *b*, represents the effectual vacuum on piston for the entire revolution, while the dotted line *C*, *D*, represents the load on the engine or what might be called the "line of resistance," while each ordinate represents 6″ of piston travel. In card marked No. 1 we have at the commencement of the stroke a live steam pressure on each square inch of the piston area, equal to 51½ lbs. in excess of the resistance offered by the load. This pressure remains nearly constant until the point of cut-off is reached when it rapidly falls off until at a point about 21″ from the commencement of the stroke the steam pressure and the line of resistance are the same. The average pressure in excess of the resistance up to this point has been 20 lbs. per square inch, and this excess of pressure must be stored up somewhere in the piston and its connections, and must now be called on to finish the remaining 39″ of the stroke. A brief calculation will show that an average of 9.6 lbs. is "wanted."



The piston, commencing its strokes with a force greatly in excess of the resistance offered by the load, would go like a flash of light were there not some means of receiving its surplus force. The main receiver of this surplus force is the fly pulley which receives and retains it until the force and resistance are in equilibrium, when gradually a part of it is given out again in useful work. The average pressure in excess of the resistance for the entire revolution is a mean of 5.1 lbs., and it is an interesting question to determine what becomes of this surplus power. Is it used up in its transmission to and from the fly-wheel of an engine, or is it used in retarding and then accelerating the piston and its connections as the crank passes the centers? The writer freely admits that he has not found any entirely satisfactory solution to this question up to the present time, and is compelled to leave it to the kind consideration of some "Ph. D."

Again, during the brief interval of time the piston has been moving 10 ft., the rim of the pulley has moved through 62.3 ft. of space, and $62.3 \times 22{,}206.7 = 1{,}383{,}477.41$ ft. lbs., while the effectual area of the piston $((536''))$ $\times$ 32.9 $\times$ 10 = 1763.44 ft. lbs.; from which we conclude the energy stored up in the pulley when making 50 revolutions per minute is 7.84 times the energy exerted by the piston.

Here is abundant food for reflection, to which the writer hopes to return at no distant day.

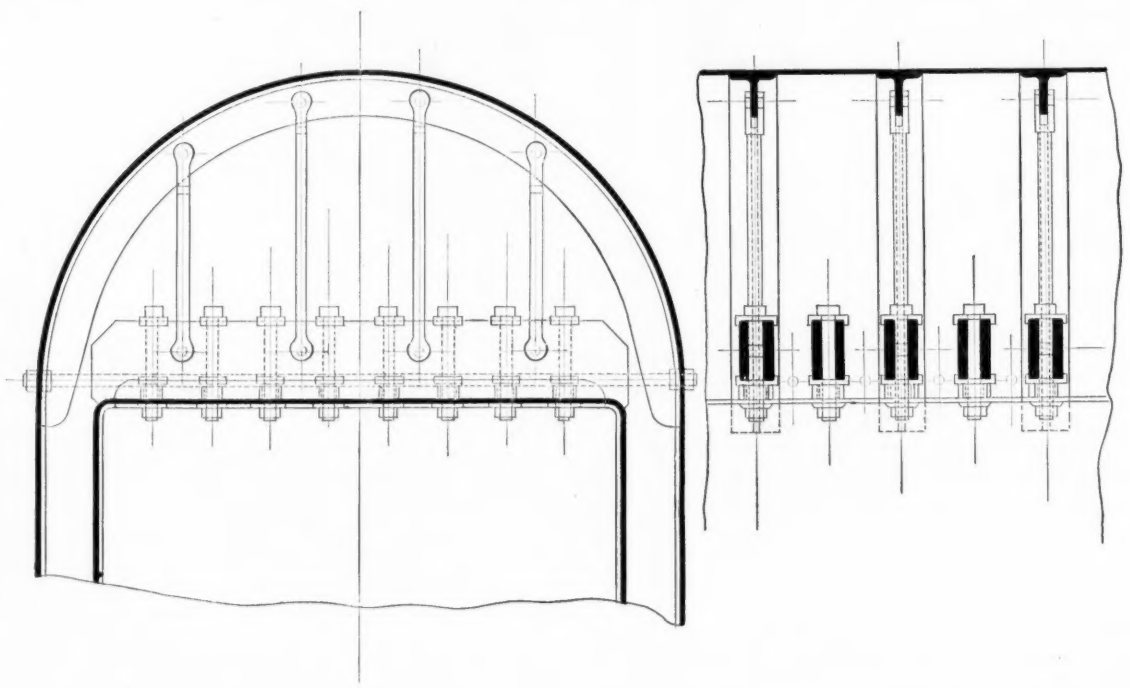
Letters from Practical Men.

EXPLOSION OF LOCOMOTIVE "LEHIGH."—THE CAUSE AND PREVENTION.

The illustration shows the back part of the boiler of the locomotive "Lehigh," which exploded at the Hoboken (N. J.), depot, October 28th, 1879, killing the engineer and fireman.

Before reading one word of the testimony, I saw at a glance the cause of the terrible accident.

In the testimony of a mechanical expert, he states that he expected to find some weak spot, but found none; he also adds that he had never seen, during his whole practice, a boiler better constructed, or one that seemed better to anticipate every strain that might be brought to bear upon it than did this one, and judging of it by all the rules known to practical science, the boiler was at least 400 per cent. or 500 per cent. stronger than the requirements for the pressure to be carried. He also states, that the braces themselves in the boiler, as it stands, should be strong enough to hold the entire pressure, which they did. In other words, the whole top ought to have gone off when the sheet was broken, but it did not, therefore the braces showed sufficient strength to hold the entire rupture at the first row of braces.



Now, I fully agree with him on that, regarding the number and strength of the braces. But, nevertheless, he must acknowledge that they did not prevent the explosion. And I feel satisfied that these very braces *did* cause the explosion, in the way they were connected to the shell of the boiler. The end of the braces that are connected to the crown-bars is correct and proper, as the strain is distributed equally over the whole surface of the crown-sheet; but the end of the braces that are connected to the shell pulls on the spot only where the braces are connected, and all being on a straight line, one crow-foot meeting the other, and with high steam and constant expansion and contraction, this causes the plate all along the edge of the crow-feet to serve as a hinge, and it is but a matter of time to crystallize, or fracture the best plate-iron that could possibly be made.

The top of the boiler, or, in other words, a spot on the top of the boiler is not strong enough to sustain itself and the crown-sheet, unless we bring the whole surface to bear an equal share of the strain of the crown-sheet. This can be done by using T iron bars, $3\frac{1}{2}'' \times 3\frac{1}{2}''$, bent around the shell, and extended down the sides to meet the stay-bolts running through the fire-box. Then connect the crown-bar braces to the T iron, and also the cross-braces to the ends of the T iron. Doing this, you bring the whole surface of the shell-plate to bear an equal share of the strain of the crown-sheet, instead of pulling on spots of the shell. Had the "Lehigh" boiler been braced in this manner, the explosion would never have taken place under the same circumstances.

It will be observed from the illustration, that the piece was torn from the solid plate, and does not touch the rivet holes, except where the wagon top joins with the sloping part of the boiler. But it did touch the edge of the crow-feet all along the line where they were connected, which was a much better shearing edge than the rivet holes, as they were rather too far apart for that, and, at that particular place, the iron is much stronger. It will also be observed by the illustration, that the nearer we approach the head of the boiler, the stronger we find the ruptured plate, until it is finally torn off, as near as I can judge, about 18 inches from the end of boiler.

Now one would think that it would have run straight along and gone off at the end of boiler at the rivet holes. Yet this is easily accounted for, as the nearer the head we go the less the iron is crystallized, the head giving it strength, and consequently it was subject to less hinging than was the balance of the ruptured plate.

A circular shell is all strength, so long as you don't take hold of it. If you are obliged to take hold of it to support a flat surface, you must do it equally all around the shell. Take a rule and measure the surface of the crown-sheet, and then get the surface that the stays are connected to on the shell of the boiler; you will find that you will have square feet on the crown-sheet against square inches on the shell as the crown-braces distribute the strain equally over the whole sheet, while the braces connected to top of shell are pulling on spots only.

I know of no better way to illustrate the nature of the bracing in the "Lehigh's" boiler, than this: Take a plate of iron the same quality and the same size as the ruptured plate in the "Lehigh's" boiler, and fuller it lightly every day for two or three years, or as often as the ruptured plate was obliged to expand and contract on a straight line the width of two inches, or the width of the crow-feet by the length of the plate, and we all know too well what the consequence would be. Yours truly,

HENRY SCHAUBEL,
Sup't of Neafie & Levy's Boiler Shops,
202 Richmond St.,
Dec. 15th, 1879. Philadelphia, Pa.

DOCTORING AN ENGINE.

Editor American Machinist:

One of the leading manufacturers called me into his office lately, saying, he wished me to have a little talk with a traveling "engine doctor," who claimed to make such changes in the adjustment of the valve motion of any slide valve engine as would result in a saving of about 50 % in fuel. The "doctor" presented letters from several engine users, who readily testified to the wonderful improvement he had effected. As I did not inform him that I was a trifle in the engine business myself, he probably made a mental calculation of my H. P., and set down as a result that I was either a minister, or State Senator, whose surplus wealth was invested in said manufactory. We adjourned to the engine-room, and he took down the cylinder-head, removed the springs in the piston-head, and replaced the cylinder-head, during which operation he informed us that springs under the rings were fruitful sources of friction. He then lengthened the eccentric-rod about $\frac{1}{4}$ of an inch, and shifted the eccentric, increasing the lead from about $\frac{1}{16}$th to $\frac{3}{8}$ths of an inch. "That's all there is of it," he said, "I do it all from this end of the machine," indicating the front end, "and no man living knows, or can find out the secret. Can any man here tell me why we want more steam on the piston-rod end than the other? No; of course they can't. Well, gentlemen, you ain't apt to give it away, so I'll just tell you: The piston-rod is two inches in diameter, and seven, eight, five, four, gives fifty-six solid inches that it takes out of the cylinder on that end, so we want to make up for that loss by giving her more steam—see? The other little operation is the secret of the whole, and I was offered $10,000 to put Jones and Smith, the big engine builders, on it. I took Jones—he's the machinist—out into his shop, and picking up a solid wrench, I slacked off the eccentric set-screw. I just run my eye along the valve-stem—never touched the chest cover, nor saw the valve at all—shifted the eccentric a little, and the business was done. I did it over three times, but Jones couldn't get it, nor no other man either. He offered me $10,000 to give it to him, but you bet $20,000 wouldn't buy it. Why, I was running an ocean steamer, and she wouldn't do any thing with 130. I just made the little change, and she just did ten times the work with 40. The trouble with all engines is back pressure, and my little business does away with that. Ten dollars? Yes, sir, that's the price of the improvement;" and he got it too, notwithstanding I took the trouble to show the owner that his engine was in ten times worse condition than before she was touched; that the card I took off showed she was all on 'one end,' that the compression was ahead of anything I ever saw, that she exhausted too soon, and that she was the worst mixed-up machine on the American continent. I even tried to penetrate the fastness of his muddy perceptions by taking him outside, and showing him, by ocular evidence that she was on "three legs," by directing his attention to the exhaust pipe. No go, however. He said the experience of the men who had tried this man's plan, and certified to its beneficial results was worth a thousand "cards." Even the "doctor" said I was "one of them theorizing fellers." In ten days time the owner of that engine will want some one to put her back where she belongs. If he sends for me or any of my men, we will have a sudden stroke of paralysis or something else, and won't be able to go.

P. S.—There are, evidently, lots of insane asylum patients who own stationary engines.

FRANK C. SMITH.

Delaware, O.

CUTTING SCREW THREADS.

Editor American Machinist:

In your issue of January 10th, L. O. Chapin, of Sedalia, tells us of a man who cuts screw-threads without reversing the motion of the lathe, he having marked the face-plate and the shears. (I hope they are chalk, and not file or chisel marks.) I believe I would rub them off; they are unsightly and seem to me to be useless.

It is true, that in cutting screws with the lathe referred to, the lead screw of which had three threads to the inch, the marks could be used, provided the carriage is allowed to travel an even number of inches or thirds of an inch; but this cannot always be done, and would be a loss of time if it could.

When cutting any thread which is equal to, or a multiple of the thread on the leading screw it is never necessary either to stop or reverse the motion of the lathe, but let it run all the time, loosening the lock-nut when the tool has traveled the desired distance along the work, slide the carriage back, set the tool for another cut, close the nut and "it goes ahead," all right every time.

In cutting threads which are not of equal pitch with the leading screw or a multiple of that pitch, the reverse motion is a good thing.

SAM MOSHER.

Winchester, Ill.

TO FIND THE PROPER GEARS FOR CUTTING SCREWS IN A LATHE.

Editor American Machinist:

Suppose our lathe with even gears on stud and screw will cut 12 threads to the inch—say these gears have 48 teeth, and we want to cut 14 threads to the inch. We want, then, a gear on the screw of our lathe $\frac{2}{12}$ or $\frac{1}{6}$ larger than that on the stud or spindle; 48 and $\frac{1}{6}$ of 48 make 56; therefore, 48 and 56 will cut 14 threads. For 16 threads we want the screw gear $\frac{1}{8}$ larger; that is, 48 and 64 will cut 16. For 18 it must be $\frac{1}{2}$ larger or 72. For 20, $\frac{2}{8}$ larger, or 80, and so on.

If our lathe with even gears cuts 4 threads to the inch—say 24, and 24 gears, then 24 and 36 will cut 6 threads; 24 and 42 cut 7 threads; 24 and 60 cut 9, and so on.

From the above one may make his own screw table.

H. NORTON.

Bernardstown, Mass.

The Dimensions of Steam Ports.

BY E. P. WATSON.

What are the proper dimensions for steam ports to steam engine cylinders? In propounding this question, I am well aware that past generations of engineers have discussed it in all its aspects, and settled it to the satisfaction of some of them, so that there ought to be no occasion to ask such a question; but there is occasion, as the varying practice of the day shows. Whether the practice of the day is founded on deductions from the best practice, is a matter I do not intend to discuss. American engineers, as a class, have a bold contempt for precedent, which is a good thing in some lights, and a poor one in others.

For example, speaking in metaphors, when a hand book says the area of the steam port in square inches shall equal the diameter of "Saturn's rings" multiplied into the length, breadth, and thickness of them, how does the engineer who compiled the rule arrive at it? What does he know about it from any aspect? Nothing at all, probably, except what the indication of a certain engine, under a fixed duty, has told him; but is that a sufficient guide to lay down a rule to work by for all time to come?

Figured by this rule, an engineer perceives that, for a given power, he has for a steam port a yawning gulf or a griping crack; neither of which commends itself to his judgment; so he slaps the book together, and makes the ports to suit himself. This may be the reason why we find so little uniformity in the sizes of steam engine ports in the practice of the day, since every man makes his own size. John Smith's father had a local reputation as a millwright, and *he* said: "The port for a $12'' \times 12''$ ought to be $1\frac{1}{4}''$, if you want to get any turns out of her," so he made them of that size; but John Jones' father was also a millwright with a charac-

ter, and he made the ports only an inch, because, as he said, he wanted the valve to get back again the same day. So far as mere appearances went, one of these engines worked as well as the other, under equal conditions.

Further than this, the practice of locomotive builders, in most cases, is identical; that is, they adhere more closely to certain dimensions than stationary engine builders do, but I know of one man who departs widely from current practice. His locomotives draw high speed trains and heavy freight trains over stiff grades, against competitors who have half as much again breeches, in the matter of steam ports as he has. I quote from memory only, and will not assert that I am right, but I am very sure that his steam ports for an 18″× 24″ are only ten inches by one inch—three and four inches less than the general practice. I would not quote these instances, if they did not seem to indicate that the dimensions of steam ports was not a matter to make any pother about.

Individually, it seems to me, that there is a relation between the amount of duty demanded and that performed; and that the steam port, as part of the machine, has a great deal to do with it. It is easy to see that ports may be too small, both inlet and outlet. Some engines are so wheezy in their exhausts, that it would seem an act of charity to pour a little Cherry Pectoral into them; but can the ports be too large? High speed engines demand free entrances and exits; but what is the limit to size, beyond the extra duty entailed by the long travel on the valve?

With all our indicators, calculations, improved valve motions, and cut-offs, the steam engine, at best, is a mystery. I use this word advisedly, much as I detest it, for, as a rule, I don't approve of mysteries. For every effect there is a cause, but in steam engines of the same size and general construction, as to detail, there is such a wide diversity of duty, that perhaps I may as well say it is a mystery. I might cite instances in support of my assertion, if it were necessary, but I am very sure that the experience of most engineers will bear me out in the statement without them.

Of two engines—twin patterns in all respects, side by side, and coupled to the same shaft, how often does it happen that we can get equally good indications from both ends of the same cylinder, or from the same ends of the separate cylinders?

Improvement in Sleeping Cars.

A new sleeping-car berth has been invented by Supt. W. H. Paige, of the Wason shops, Springfield, Mass., which does away entirely with the frame-work of the cumbersome upper berths, hung away in the ceiling, which adds so to a car's weight. The material for both berths is stowed away between the seats, so that when not in use the car becomes a first-class drawing room car, with large high-backed comfortable seats, the back 30 inches or any desired width, upholstered with light springs, same as are used in drawing-room chairs. They can be upholstered in that form because they are not used in forming the berths, consequently there is no wear coming on the plush covering.

Boiler Making Improvement.

The difference of expansion arising from the unequal temperature of the top and bottom parts of a boiler often gives rise to serious difficulty from the leaking through riveted joints directly over the fire. Much study and experiment have been given to this subject by boiler-makers, and various expedients are used to overcome the difficulty.

Some concerns in England recently tried the welding of the plates in complete rings, so as to avoid having any riveted joint in the bottom of the boiler with sufficient success to warrant their adoption of the plan for extensive use. There are, however, serious objections to the welding process, as the soundness of the work depends largely upon the individual skill of the workman employed in performing the operation. A new method has now been brought out by the Palmer Shipbuilding and Iron Co., Jarrow, which is not open to such objections. The plates are rolled long enough to enable a complete boiler cylinder to be formed of only two plates instead of several short ones, as is the custom in the ordinary mode of construction. Plates were rolled, each weighing over two tons. As much difficulty was experienced in bending these plates by means of the ordinary horizontal rolls, a new style of bending rolls of vertical form was devised, which are said to be exceedingly simple in arrangement and eminently successful, saving fully 50 per cent. of the labor and time consumed in the ordinary course of plate bending. It is also stated that the "set" of the plate is obtained to a nicety with perfect ease.

FIG. 4.

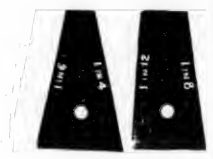


FIG. 5.

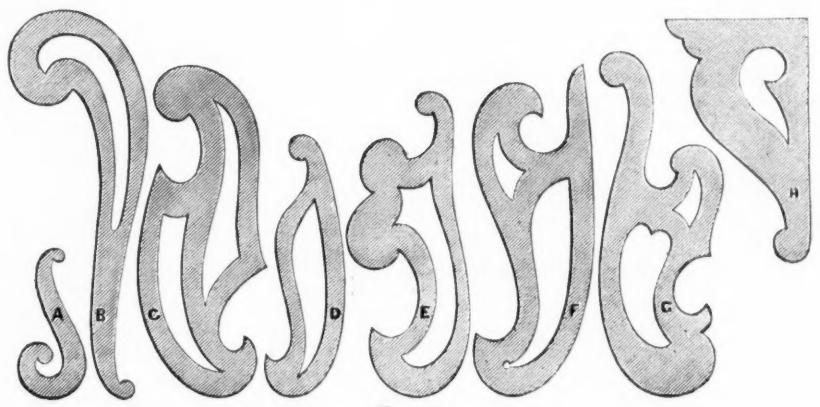


FIG. 6.

Practical Draughting.—T Square, Triangles, Batter Slopes, and Irregular Curves.

BY T. P. PEMBERTON.

The T square is a very useful and important instrument for the draughtsman, and, therefore, too much pains cannot be taken to get one that is "true"—neither too heavy nor too light. There is no instrument which the draughtsman uses more frequently than this, and there is no drawing instrument that gets such a variety of experiments and fancy makes upon it as this. It is sometimes made of apple or pear wood, with a brass piece, about $\frac{1}{32}$″ in thickness, let in the edge of the "tongue," or "blade." Such squares are made and used by the French. Mahogany, rosewood, bird's-eye maple, and other of the finer woods, are used in their construction. Black walnut is altogether unsuitable for T squares or straight edge.

The T square has four parts, known as the blade, the fixed head, the shifting head, and the swivel. The accompanying cut (Fig. 3) represents the T square.

The head is held firmly by the left hand to the left edge of the drawing board, and the blade serves as a straight edge for horizontal lines that may extend the whole length of the paper. It can be used for either horizontal, or, by reversing to the bottom of the board, for vertical lines; and, by turning it over, so that the shifting head is against the edge of the drawing board instead of the fixed head, lines at different angles may be drawn. A good proportion for a T square is to have the head one-third of the length of the blade. The length of the blade should be the length of the drawing board; if it is shorter, inconvenience will be experienced when lines the whole length of the board are wanted.

Mechanical draughtsmen use, more especially, two triangles in connection with the T square, one having angles of 30°, 60° and 90° (degrees), and another having angles of 90° and 45°; also others, for making letters. These are of various sizes—from three or four inches and upwards. In use they are slided along the edge of the blade, and need not be any thicker than the blade. They are made of rubber or hard wood. Their shape is represented by Fig. 4.

By these vertical lines, triangles, squares, hexagonal, octagonal and twelve-sided figures, diagonal section lines, &c., can be easily drawn, and, although the simplest, they are certainly among the most useful instruments used by draughtsmen. For ordinary purposes, the triangle with angle of 45° may be 4″ long and the other 8″ in length.

The following extract is from a treatise on the use of mathematical instruments:

To see if the right angle of a triangle is correct, draw a straight line, and bring the

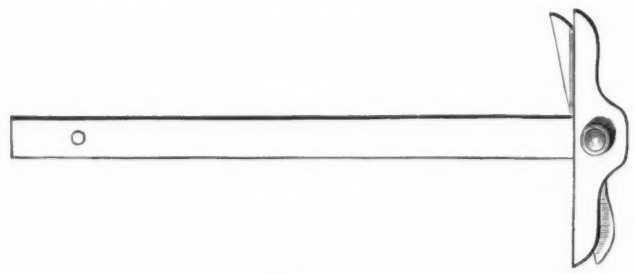


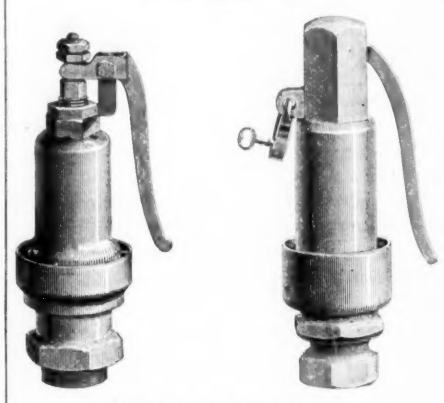
FIG. 3.

edge of one of the sides exactly on it, having the right angle about the middle of it; then draw a line along the other side, from the right angle; now, it is to be supposed there is a right angle on each side of the last line drawn; to prove it, take up the triangle and place it in the same position it occupied before, but on the opposite side of the last line; now, if the angle of the triangle is not 90 degrees, when one side corresponds with its line the other will not. To prove the angle of 30, see if it is one-third of ninety, and the angle of 60 should be double the 30 angle.

The edges of the triangle can be tested in the same manner as the edges of a straight edge. The simplest way to test the right angle of a triangle, is by the right angle of the T square, one edge of the triangle being held against the blade and the two right angles brought together; the other side of the triangle should fit evenly on the head of the T square; the other plan is the most correct, as there may be an error in the angle of the T square.

"Batter slopes" made of hard rubber, as illustrated by Fig. 5, are useful in giving batters of walls and rock, and are used in a similar way to the triangle.

Irregular curves, as represented by Fig. 6, or as they are sometimes termed, sweeps, are used for curves that cannot be put in by the bows. They become very useful when elliptical or parabolic curves are desired, in preference to circles or arcs of a circle. They are much used in design and architectural drawing. They are made of thin hard wood or rubber, and sometimes of horn.



"Pop" Safety Valves.

The general principle of the "Pop" Valve made by the Consolidated Safety Valve Co., Boston, Mass., has been so fully described in our columns, that no detailed reference to it is needed at this time. We illustrate herewith two new adaptations of this principle to steam engine work.

The Locomotive Valve represented in the cut, is entirely new, and is made with brass case, and with or without relief lever attachment. It can be furnished, all fitted up and adjusted to the required pressure, ready to screw into the dome cap, thus doing away with studs and cross bars, and occupying less space than the old style. It may also be provided with a locking-up attachment, so as to prevent alteration or tampering, if desired.

The Special Valve for Portable and Farm Engine use, here shown, is also automatic and safe in operation, no explosion having ever occurred where one was used, notwithstanding the careless and unskilled handling such engines receive from the average rustic. When the valve is set for the required pressure of steam, and the case locked up, all access to the valve or spring is positively barred; nor is it possible to disturb the adjustment of the valve without unlocking and removing the cap. Under such circumstances, the countryman who wants to blow himself up, must either resort to a key or a crowbar.

The lever shown in the cut is so arranged that the valve may be lifted by it at any time to blow off the steam from the boiler; but it cannot in any way be used to bear down upon the valve. A lead rivet may be used to seal the valve in place of the lock shown in the cut.

TEMPERING POINTS OF TOOLS.—After being tempered the volume of the tool is slightly increased, and consequently its specific gravity is decreased. As the expansion or increase of volume is so very slight, it is quite immaterial which is plunged into the liquid first; however, every moment the edge is kept out it is cooling, and the tempering may be rendered defective thereby. Mercury tempers the hardest, then water, then salt and water, then oil of various kinds—as whale oil. As oil cools the metal more slowly, it is not tempered so hard, but the tenacity is increased.

An exchange says that this country is now making more than one-third of all the paper in the world. The product is about 1,830 tons daily, amounting to about 640,500 tons per year. There are now 927 mills, representing a capital of $100,000,000. These mills employ 22,000 persons, who draw about $9,550,000 in salaries per year.

Turbine Water Wheels.

No. IV.

BY SAMUEL S. WEBBER, C. E.

In making a comparison between the different wheels in the market, there are many difficulties to overcome, such as getting any correct measurements of the discharge and inlet areas of buckets, etc., owing to some wheels having such distorted shapes to the buckets and chutes as to defy any accurate measure of them. Others are very plain and simple in form, and it would seem as though some builders of the first kind mentioned tried to get as many crooks and turns in a wheel as possible; for what object, I confess I do not know, and certainly, I have found several of the inventors of these wheels who, themselves, had very misty and vague ideas on the form of a wheel bucket, seeming to regard a water-wheel as a sort of trap, and the more crooks and twists in it the more the water would have to squirm and push to get through, and "*that of course meant power developed.*" Others, better informed on hydraulics, had evidently studied the matter carefully, and could, when they chose, give some reason, good or otherwise, for their designs, while a few still better informed, and possessing a good theoretical knowledge on the subject, backed up with good sense and judgment, could show the why and wherefore for all they did, and had good practical results to show for their trouble.

In considering the best form for chutes and buckets, we have to decide on the type of wheel that they are to be applied to. We will find the simplest and one of the best forms is the Jonval wheel. These wheels, as built by R. D. Wood & Co., Philadelphia, and known as the Geyelin Jonval, have given in many cases very high percentages. I have tested several of them at different times, under different heads, and obtained results of 80 per cent. to 83 per cent. useful effect. At the same time when not properly made, the results were equally poor. I have one test of this make of wheel that was 10 per cent. from what was guaranteed; but the makers supplied new wheels that came up to the guaranteed percentage, and, I think, in justice to Mr. Geyelin, that the trouble was they did not follow his drawings in the shop as carefully as they should have done. The form of bucket used in the Jonval wheel is nearly as per Fig. 1. The chutes are very much the same in shape, and placed directly over the wheel, being curved in the opposite direction. I consider that for all downward discharge wheels, whether the water be delivered on top or from the sides, this form of bucket will give the best results. Only, of course, in the case of a wheel having the chutes around the circumference, and delivering the water sideways on the buckets, we must extend them upwards to receive the water and turn it downward on to the curved portion of the bucket. And let me here state, that most experiments have shown that in these wheels the upper part of the bucket, nearest to the chutes, is of no use beyond receiving the water into the wheel; all talk about the impact of the water on this part of the bucket, when the wheel is running as it should, is entirely fallacious. I know there are water-wheel builders who will take opposite grounds on this point, but I can only say that the facts are against them, and I shall allude to this point further on.

The question as to what is the best form of guides or chutes and gates, is quite as important as the form of bucket, as it is as essential to convey the water properly into the bucket as to use it afterwards. There are about a thousand and one different designs for guides and gates before the public; some *very good*, others fairly so, and the most of them utterly worthless, so far as durability and efficiency go. I think the term "fly-trap," as applied to a certain class of gates by some persons familiar with the turbine business, is a very good one. They would do quite as well to catch flies as anything else, and after a little use, would let the flies leak through as fast as they do the water. The register gate is a good form, and a very popular one with the builders and the public, and, when properly and accurately made, is strong, tight, and durable; and if the chutes are of proper design, a good average percentage can be obtained with it; provided, of course, that the wheel inside is worth something more than for scrap iron. Some builders have the gate outside of the chutes, others place it next to the wheel, the openings in the gate forming part of the chutes or waterways. As to which place is the best for the gate I could not say for all wheels. The inside gate has this advantage: for a given size of wheel you can get the gate of the minimum diameter, and, besides being tight for a given thickness of metal, it is also stiffer and less liable to stick under pressure.

The cylinder gate is also one of the best as well as the oldest forms. This has the same advantage for strength and lightness when placed between the chutes and the wheel as the inside register, only its action is up and down instead of revolving about the wheel center. The cylinder gate has the merit of great durability, but unless used on wheels adapted to it, or having wings cast on to its outer circumference, and forming the top of the water ways, is apt to give very poor part-gate results, while when fully open and out of the way the wheel will show a high percentage. The Boyden wheel is a striking example of this; wheels giving high duty at full gate have proved wretched at $\frac{3}{4}$ or $\frac{1}{2}$ gate. The Swain wheel, built at Lowell and North Chelmsford, Mass., has a first-rate gate, it being a flanged cylinder, with the guides attached to this flange and raising to close through slots cast in the upper casing of the wheel, a chamber being formed for the purpose in this casing. At all stages of opening the water has a free smooth passage at sides, top and bottom, all of which are on an angle forming a contracted passage to the wheel and allowing of a high velocity to the water as it issues into the wheel. The Swain wheels have given excellent results. Mr. Jas. B. Francis' test of a 72" wheel at the Boott Mill, Lowell, Aug., 1874, showed a result of 83.9% at $\frac{12}{12}$ of, or nearly full gate, at $\frac{10}{12}$ gate 83.4 %, $\frac{7}{12}$ gate 79 %, $\frac{4}{12}$ gate 66.9 %, and other tests have proved these figures correct. The wheel is of the central and downward discharge pattern, and is a fine example of its type. I shall have occasion to mention this wheel again in regards to the buckets.

Another point is the angle at which the water is brought upon the buckets or into them, and there seems to be scarcely two builders who agree on this. I find on measurement of several wheels, that a line drawn tangent to the wheel from the inner edge of the guide will form an angle of from 15° to 35° with the face of the guide as shown in Fig. 2, *a*, tangent line, *b*, angle. I have drawn the buckets radial in this instance.

The angle of contraction in the chutes is various, some being parallel, others 10,° 15° to 20° and a few of the curved ones, while not being exactly expressible in angles, show a greater divergence in the average form of the passage. It would seem, however, that from 15° to 22° was about the best range for the angle of guide, according to the diameter of the wheel, and 12° to 15° for the angle between two guides forming the chute. The upper and lower flanges forming the top and bottom of the chutes are in some wheels straight or parallel, and in others convergent, which form, I think, is far the best. See Fig. 3, angle A,: here the angle varies in different wheels from 10° to 35°; in two of the best it is about 25°, the lower line of the angle being nearer to horizontal than the upper one, in the one of these two wheels; see dotted lines a'. The number of chutes is also a point upon which there seems to be a great difference of opinion, some builders contenting themselves with six, while some put in from twenty to twenty-five in a 30" wheel. There is no doubt that the few are cheaper to build and perhaps less liable to clog up with leaves, ice, etc., and I think the following, as it appears in a wheel circular, is not far out of the way:

"Many builders claim that their wheels are not obstructed by drift or rubbish getting into them; this may be true of some wheels, but first-class wheels cannot be built with buckets sufficiently open to allow obstructions to pass freely through and give a high result for the water used; nor can a wheel be made strong enough to endure being brought to a sudden standstill, and all the machinery connected with it suddenly stopped by obstructions getting into the wheel without injury, unless it be made in such clumsy proportions as to be worthless as a motor."

Keep obstructions out of them, have a good rack or grating above the wheel and keep it clean; it *will pay* to do it. A wheelman once pointed to his wheel with evident feelings of pride, and said: "There's a wheel what you can't clog up. Why, I can stick my leg through it easy." It was a 25-in. wheel. He was right, and his wheel gave only 68 per cent. at full gate; the water went through about as easy as his leg. The two best wheels of the type having a small number of chutes, are, the Tyler wheel, built at Fitchburg, Mass., and the IXL turbine, built at Keene, N. H., by the Humphrey Machine Co. The Tyler wheel I have tested, and it gave a little over 81 per cent. I have not tested the Humphrey wheel, but have heard it well spoken of. The Risdon, Swain, Hercules, and Hunt wheels are the best representatives of the class having the greatest number of chutes and buckets, and are beyond question A1 wheels, all giving over 80 per cent., and the first named over 85 per cent.

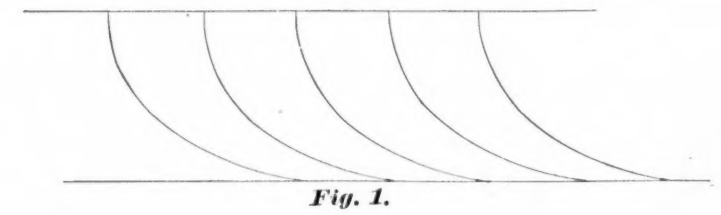


Fig. 1.

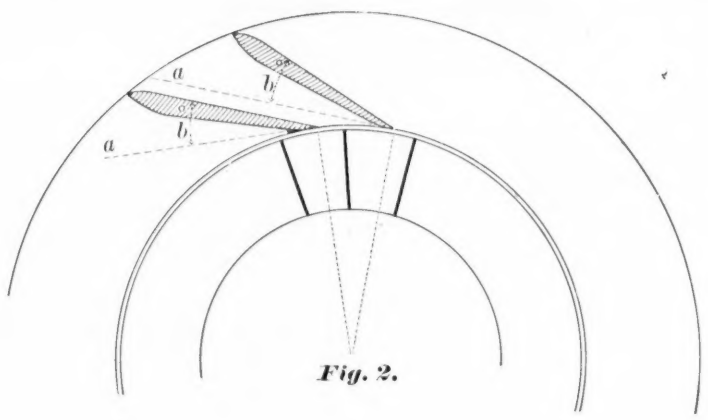


Fig. 2.

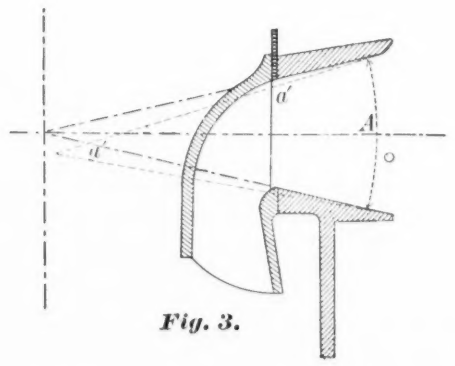


Fig. 3.

Boiler Proportion and Construction. — Feed and Blow-Off Pipes and Valves.

BY WM. H. HOFFMAN

An 80 horse-power economical engine will require an evaporation by the boiler of 1,800 lbs. of water per hour, for the cylinder alone; and an additional amount of at least 200 lbs. per hour for loss by radiation, etc.

The perfect feeding apparatus should distribute this 2,000 lbs. of water uniformly, as to time and quantity, through the space of sixty minutes, and into the body of water in the boiler at a neutral point or plane of temperature.

The feed pipe should not enter the boiler near the bottom for several reasons.

The first is the bad effect this method has on the *fire-sheets* of shell, by sudden contraction, as the water reaches the sheets where the fire is fiercest, at a temperature 150° below that of the water already in the boiler, assuming the feed water to be heated by heater to 180°. Another great objection to entering the boiler (with feed) at the bottom, is the matter of sediment, or, in many cases, quantities of mud, that rapidly collect at this point, and almost wholly obstruct the feed passage; anything in the water liable to produce a deteriorating chemical action, will, of course, attack the fire-sheets at once, and fitting and grooving is the result.

Then, again, the feed water should not be delivered too near the water level, as all foreign substances in the water, will, at this locality, promote priming, together with the natural disturbing elements thus near the surface where the steam takes its final leave of the water, besides its tendency to affect the temperature is still more, so far as the steam is concerned, than at the bottom of shell.

As I stated in a previous paper, steam should leave the boiler through a perforated pipe.

Now the feed water should enter the boiler at the central plane of the temperature of the body of water, through a *fine grade* perforated pipe, screwed into a seat-plate bolted to front head of boiler, the pipe passing through the entire length of boiler; and this pipe should be so arranged and fitted, that it can be easily removed from the boiler, when steam is off, and cleaned. It should be supported in two places within the shell, and should be turned and bright on the outside throughout its whole length.

Now the holes in this pipe should be in the lower side, so that the entering currents of water will unite and travel downward with the circulating cool currents already in motion, as they help to induce rapid circulation. The holes in the pipe should not be larger than $\frac{1}{8}$ of an inch in diameter in three rows.

When these conditions are complied with, we have the minimum loss by feeding. Let

any disbeliever try this once; it will not cost him much, and will surely pay him. The blow-off pipes should consist of two connected, of course, but independent in action. The lower one should be at the extreme bottom of shell, the upper one within three inches of the mean surface of water. This pipe should be 3″ in diameter, perforated with ⅝ holes, and nippled down on the outside of head to 2″ diameter (for a 66″ shell); the pipe must extend the whole length of boiler. This constitutes a reliable surface blow.

The inside perforated feed pipe should have a connection, outside, with the 2 inch blow-off pipe, in order to clean it now and then by blowing through it.

Every check valve should be so constructed that it can be raised from its seat by hand from without, and its position shifted; by this arrangement its correctness of working can also be tested. All blow-off valves must be of the screw-lift system, either globe or gate pattern. I am now comparing gate with globe valves. The great trouble with globe valves, besides their cramped and angular lines of passage, is their want of proper area, compared with the pipe that matches them. A 4″ globe valve, as you find it in market, has a clear space of 9½ square inches, and a 4″ pipe has an area of 12½ square inches. All boiler mountings clear of the shell outside should be brass, to resist corrosion and to present a neat and cleanly appearance, and the drippings and discharges of water gauges, and gauge cocks, should be carried entirely clear of the shell, head, and fronts to a suitable drain.

* * * * As some of your readers do not comprehend my article relating to the tube and grate area, also heating and grate surface, I will here explain that the total *area* of *opening* for the passage of the gases *through* the tubes, should be no less than *one-eighth* (⅛) the total *area* of *grate surface*, and no more than one-fifth (⅕) of the grate.

In regard to heating and grate surface, my proportion is from 32 to 34 square feet of heating surface to one (1) square foot of grate surface or area.

Under no circumstances more than 36 square feet of heating surface to one (1) square foot of grate with natural draught.

Wind as a Motive Power.—Its Velocity, Duration, and Pressure.

BY GEORGE S. STRONG.

Having spent some years in the investigation of the above subject, and knowing that due credit is not given this cheapest and most primitive of all modes of motion, on account of its supposed irregularity and inconstancy, I have thought it no more than right, that this false impression should be corrected. I therefore beg to make the assertion, that for many purposes, such as pumping water for irrigation, drainage, and railroad water stations, and for pumping sewers in cities, where there is not a natural drainage to produce a current and prevent stagnant accumulation (as the Baltimore Basin, New Orleans Flats, and the Chicago River), and for all kinds of grinding, as yet there has been no power discovered that equals this in cheapness, and that is so universally at command.

To back the above assertion, let us consider the element itself. Reference to the register of the anemometer of the Philadelphia branch of the U. S. Signal Service, representing the actual velocity of the wind for the month of December, 1879, (observations being taken six times daily), will show that during the month there was a current of wind heavy enough to do effective work on a properly constructed wind engine during 620 out of 744 hours. In other words, during only 124 out of 744 hours, was the wind below the power-line or velocity required to drive a well-designed mill.

During the entire month of December, the total travel of wind, as registered at the Philadelphia office, was 7,764 miles, or ten and seven-tenths (10.7) miles per hour on an average, while the highest velocity attained during the month was 32 miles per hour. If objection is made, that December would naturally be a windy month, the reader is referred to a similar registration covering the entire year of 1879. It should be further noted that the Philadelphia Signal Office is located in the lower part of the city in a depression, with very high buildings all around it, so that the anemometer is not enough above surrounding objects to give the highest velocity, such as would be shown by one arranged on an open plain or sea coast.

QUARTER DAILY OBSERVATIONS.

	Noon to 6 P. M.	6 P. M. to Midnight.	Midnight to 6 A. M.	6 A. M. to Noon.	Total.	Highest Velocity.
Jan.....	2643	2397	2888	2113	9246	48
Feb.....	2396	1946	2001	2169	8512	36
March....	2327	1672	1557	1983	7539	48
April.....	2780	1998	1847	2366	8991	50
May.....	2181	1709	1281	1794	6965	27
June.....	2114	1615	1344	1833	6906	30
July	2196	1722	1422	1830	7160	30
Aug.....	2061	1614	1316	1832	6868	32
Sept.....	1867	1433	1331	1725	6356	33
Oct.....	1906	1423	1111	1692	6132	36
Nov.....	2352	1914	1755	2242	8263	40
Dec.....	2247	1791	1891	2035	9964	32
Total	27075	21224	18989	23614	90902	
Mean Ml. Velocity..	2257	1768	1582	1968	7575	

From the above it will be seen that there is but little variation during the entire year, and that we have an average velocity of 10.3 miles per hour during the entire year. To get the pressure for any given time, multiply the square of the velocity by five thousandths (.005).

TABLE OF VELOCITY AND PRESSURE.

Miles pr. hour.	Pressure per square feet.	Miles pr. hour.	Pressure per square feet.
1 =	0,005	11 =	0,595
2 =	0,020	12 =	0,708
3 =	0,044	13 =	0,831
4 =	0,079	14 =	0,964
5 =	0,123	15 =	1,107
6 =	0,177	16 =	1,260
7 =	0,241	17 =	1,422
8 =	0,315	18 =	1,564
9 =	0,369	19 =	1,776
10 =	0,492	20 =	1,968

I might say much about the cause and classification of winds, but prefer to deal with the subject from a purely mechanical standpoint.

Regulations for Melbourne Exhibitors.

The official regulations for this exhibition have been issued by the Royal Colonial Commission. Such of these regulations as are deemed of importance, or of interest to United States exhibitors, are published for their information by the United States Government agent.

GENERAL REGULATIONS OF THE ROYAL COLONIAL COMMISSION.

1. The exhibition will be opened on the first day of October, 1880, and closed on the thirty-first day of March, 1881. It will be open evenings.

2. There are no differential duties, and all exhibits will be admitted free of duty for the purpose of exhibition. Facilities will be given for the sale of exhibits, delivery to be made after the close of the exhibition.

3. The protection of inventions capable of being patented, and of designs, is secured by the patent laws of Victoria.

4. If exhibits are *not* intended for competition, it should be so stated by exhibitors, that they may be excluded from examination by the International Jury.

5. Arrangements will be made for transporting goods from the port of Melbourne, or the several railway stations, to the exhibition grounds at a fixed rate of charges.

6. All expenses of freight, marine insurance, etc., should be prepaid by the exhibitor, but, if that be inconvenient, the Victorian General Commission, through its agents in New York and Boston, will, if desired, undertake the transportation, custom house formalities, unpacking and arranging the products for exhibition, the expense incident upon such work to be regarded as a first charge upon the exhibits, to be deducted from the net proceeds in the event of their being sold. Should such exhibits, however, not be sold, but be claimed by the exhibitor, or his authorized agent, at the close of the exhibition, then such sums as may have been disbursed by the Commission, or any of its agents, must be paid before such goods are delivered.

7. No work of art nor any article whatever, exhibited in the buildings, parks or gardens, may be drawn, copied or reproduced in any manner whatsoever without the permission of the exhibitor. The Commission reserves the right of authorizing the production of general views.

8. By the introduction of steam power, which will be supplied gratuitously, it is proposed to afford facilities for presenting not only the machinery for any given manufactures, but the manufactures themselves; and it is further intended that space shall be afforded for the production in the exhibition of interesting objects by manual labor.

9. The Victorian General Commission is prepared, if required, to make arrangements for the construction of show-cases by contract at a price per cubic foot, the cost to be borne by the exhibitor using the same.

10. The Commission will take precautions for the safe preservation of all articles in the Exhibition, but will be in no way responsible for damage or loss of any kind, or accidents by fire or otherwise, however caused; facilities will however be afforded exhibitors for insuring their goods.

11. The awards shall be based upon written reports adopted by the Jurors,

Reports and awards shall be based upon inherent and comparative merit, the elements of merit being held to include considerations relating to originality, invention, discovery, utility, quality, skill, workmanship, fitness for the purposes intended, adaptation to public wants, economy and cost.

Awards shall consist of gold, silver, and bronze medals, and a certificate of honorable mention, together with a special report of the jurors on the subject of the award.

Each exhibitor shall have the right to produce and publish the report awarded to him, but the commission reserves the right to publish and dispose of all reports in the manner it thinks best for public information, and to embody and distribute the reports as records of the exhibition.

No commissioner who is an exhibitor or a member of a firm exhibiting shall take any part in the selection or appointment of jurors in those classes in which he exhibits.

No person interested either as a partner or *employee* in a house exhibiting shall be a juror in the classes in which such house or person exhibits.

The size of the medals (for prizes) will be two inches and a half, the design having been adopted.

12. Exhibitors are particularly requested to mark the trade price of the articles exhibited, so as to facilitate the judgment of the jury, as well as for the information of visitors.

13. Exhibitors will not have to pay rent for space occupied by them in the exhibition.

SPECIAL REGULATIONS FOR THE UNITED STATES SECTION.

Congress having made no appropriation for the payment of freight upon goods sent to the Australian exhibitions, and having assigned no government vessels to the duty of transportation, the United States Commission will assume no direction whatever of the movement of goods either to or from Australia.

Upon the delivery of the goods within the exhibition buildings at Melbourne, and the payment of all charges by the exhibitors, the United States Commission will see that they are properly assigned to the space allotted the United States, and that they are catalogued.

The expense of installation must be borne by the exhibitors, and the United States Commission will not be responsible for expense of any kind in connection with the handling, storage, or the loss or injury of exhibits.

Special shipping labels and instructions will be issued to applicants as soon as space has been assigned them.

Office or other structures on exhibiting space which would impede the general view, or be otherwise objectionable to the Commission or to adjoining exhibitors, cannot be permitted.

A properly qualified and duly authorized agent is the acknowledged representative of an exhibitor, but when goods are exhibited in the name of an agent, awards, though recommended by jurors, are not allowed by International Commissions; it would be well, therefore, for those who intend exhibiting for competition, to make application in their own name.

The second highest bridge in the country is about being built across the Mississippi at Minneapolis. It will be 1,150 feet long, with two spans of 325 feet each, the whole to cost $300,000.

The Baldwin Locomotive Works constructed 398 engines during the year 1879. Of these 256 were made with iron boilers and 142 with steel boilers, while 388 were fitted with steel fire boxes and 10 with copper. 314 were built for American railroads, and 84 for roads in France, Norway, Australia, Brazil, Peru, West Indies and the Sandwich Islands.

WORKING STEEL FOR TOOLS.—In working steel for tools, great care should be taken to hammer all sides alike, for if one side is hammered more than another it will cause it to spring in hardening. Again, steel, when being hammered, should be heated as hot as it will stand, until finishing, and should then be hammered until almost black hot, for the reason that it sets the grain finer, and gives the tool a better edge. The reason for heating the steel so hot while hammering is simply because it makes the steel tougher when hardened, and softer when annealed, while, if it were worked at a low red heat, the continued percussive shocks of the hammer would so harden it as to make it almost impossible to anneal it, and at the same time render it brittle when hardened.

The steel steamboat for the New York and Albany Day Line is now building by Harlan & Hollingworth at Wilmington. She will be five feet longer than the Chauncy Vibbard, twelve feet wider, and will draw eighteen inches less water. This should make her a great deal faster. The engine for the new boat is being built in New York. She will take her place on the river on the 1st of June next.

TO HARDEN AND TEMPER CAST STEEL.—For saws and springs in general the following is an excellent liquid: Spermaceti oil, 20 gals.; beef suet *rendered*, 20 lbs.; neat's-foot oil, 1 gal.; pitch, 1 lb.; black resin, 3 lbs. The last two articles must be previously melted together, and then added to the other ingredients, when the whole must be heated in a proper iron vessel, with a close cover fitted to it, until all moisture is evaporated; the composition will take fire on a flaming body being presented to its surface.

American Printing in Scotland.

One of our Scotch exchanges contains a nice little advertisement of a Glasgow printing house, nineteen inches long and seventeen inches wide, displaying in bold letters the following announcement:

To the Engineering Trades.—The finest printing done on moderate terms, when quality is considered. Illustrated Catalogues printed in the finest style of art, with special machinery, erected at enormous cost. Note.—This expensive machinery has been purposely laid down in order to equal, if not excel, the iron trade catalogues produced across the Ocean, as the American style.

MOULDING SAND FOR CASTING BRASS OR IRON.—The various kinds of good moulding sand employed in foundries for casting iron or brass, have been found to be almost uniform chemical composition, varying in grain or the aggregate form only. It contains between 93 and 96 parts silex, or grains of sand, and from 4 to 6 parts clay, and a little oxide of iron, in each 100 parts. Moulding sand which contains lime, magnesia, manganese, and other oxides of metal, is not applicable, particularly for the casting of iron or brass. Such sand is either too close, will not stand or retain its form, or it will cause the metal to boil through its closeness.

Advances in Wages.

An additional advance of eight per cent. has been made in the wages of the operatives of the Pennacook and Contoocook Mills, at Fisherville, N. H., which, with the 5 per cent. given them December 1, makes the increase 13 per cent.

The Hartford Carpet Company of Thompsonville, Conn., have advanced the wages of their employees 10 per cent., the advance dating from January 1.

The Whittenton Manufacturing Company of Taunton, Mass., have notified their employees of an advance in their wages, dating back to December 1st.

The Boston Nut Company have lately advanced wages 25 per cent.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Prest.
LYCURGUS B. MOORE, Treas.
JACKSON BAILEY, Vice-Prest.
DAVIS STRONG, Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, Mechanical Engineer.

The American News Company.
Publishers' Agents, New York.

The International News Company,
(Formerly the Willmer & Rogers News Co)
11 BOUVERIE STREET, (Fleet St.) LONDON, ENG.
Will receive subscriptions for the AMERICAN MACHINIST at 17 shillings per annum, postage prepaid.

DEALERS SUPPLIED BY

The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis Book and News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh Book and News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, L. I.
The Newark News Company, Newark, N J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.
$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Outside page, 45c. per line, each insertion.
Inside pages, 25c. per line, (12 lines one inch.)
Business Specials, 40c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ Subscribers who fail to receive their paper promptly will please notify us at once.

☞ Entered at the Post Office at New York, N. Y., as second class mail matter.

NEW YORK, JANUARY 31, 1880.

CONTENTS.

	PAGE.
Double-Acting Cam-Drawing Press	1
Surface Grinding Machine	2
Extracts from Chordal's Letters	2
Tool Grinding Machine	3
Letters from Practical Men	4
The Dimensions of Steam Ports. E. P. Watson.	4
Improvement in Sleeping Cars	5
Boiler Making Improvement	5
Practical Draughting. T. B. Pemberton	5
"Pop" Safety Valves	5
Turbine Water Wheels. Samuel S. Webber, C.E.	6
Boiler Proportion and Construction. Wm. H. Hoffman	6
Wind as a Motive Power. Its Velocity, Duration, and Pressure. George S. Strong	6
Regulations for Melbourne Exhibitors	7
The Melbourne International Exhibition of 1880.	8
Auxiliaries to Practical Skill	8
Dividing the Responsibility	8
Questions and Answers	9
Manufactures.	9
Machinists' and Engineers' Supplies	10
Iron Review	10
Metal Review	10

The Melbourne International Exhibition of 1880.

In our issue of July 12th last, we published a large engraving of the Melbourne Exhibition building, with some description of the work of preparation for that grand display of the world's productions. The prospect is fair for a good representation of American productions at that exhibition. Several of our prominent manufacturers are already applying for space, and many others have expressed a desire to send exhibits. Australia is a desirable market, and the United States should avail itself of this opportunity to increase its share of trade in that direction. American goods are preferred to those of any other country, but if our producers remain at home and allow competing nations to present their products in that market to the exclusion of ours, we must be satisfied with our small share of trade. England exports to Australia annually immense quantities of her various productions, while the United States seems satisfied with a fraction of the business.

The forthcoming Exhibition at Melbourne will afford our manufacturers an opportunity of presenting to the people of that colony their varied productions, which, if properly presented, will surely be preferred, and our export trade be increased to a considerable extent.

We would call the special attention of manufacturers of machinery, tools and machinists supplies to the following letter just received by us from Mr. T. R. Pickering, the U. S. Government Agent for the Melbourne Exhibition:

INTERNATIONAL EXHIBITION, MELBOURNE, 1880.
Office of the United States Government Agency.
Room 102, Post Office Building.
NEW YORK CITY, Jan. 15th, 1880.

Editor American Machinist:

In answer to your inquiry of this date, as to the prospects of increasing the machine industry of the United States by a proper representation of our various special productions at the forthcoming exhibition to be held at Melbourne, Australia, I beg to say: Australia, at present, seems to be a promising market for wood-working machinery; machinery specially adapted for use of builders, including stone cutting and dressing machines; agricultural machinery, and appliances for shearing sheep; woolen machinery of all kinds; mining machinery; driven well apparatus; railway appliances, including rails and rolling stock, bridges, etc.; general and special tools and machines adapted for the construction and repair of machinery; complete systems of narrow gauge railway; permanent and portable forges, with complete outfits for blacksmithing; plain, strong, and economical steam engines, portable and stationary, with boilers, easy of transportation; systems of transmission of power, including shafting, hangers, pulleys, belting etc.; machines for the production of tin and sheet metal goods by the "stamping" or "drawing" process.

It is believed that with a fair showing of this class of machinery, and other special labor-saving appliances, important sales may be effected, and the export trade of this country be largely increased. If Great Britain sends annually to Australia $100,000,000 of her products and manufactures, the United States should send of her varied productions at least $25,000,000 in value, instead of a paltry $7,000,000.

I would recommend that at this exhibition everything sent from this country should be fair samples of ordinary production. There are many reasons why the Sydney exhibition is not so successful as was desired. Occurring so soon after the Paris exhibition, sufficient time was not allowed between the arrival of the Government vessels with returned exhibits in the damaged condition, to repair and reship the same to Sydney.

Applications will be received until the first of March, and goods may be shipped—if by sailing vessel from New York or Boston—as late as May, but if shipped by steamer from San Francisco, they may leave that port as late as July 7.

I shall be glad to furnish any further information to intending exhibitors. Maps and plans of buildings, showing the United States section at this exhibition, may be seen at this office.

Respectfully yours,
T. R. PICKERING,
U. S. Gov. Agent.

Upon making a recent visit to Mr. Pickering's office, at the above location, we were very cheerfully furnished the following particulars regarding this exhibition:

The International Exhibition of Arts, Manufactures, and Agricultural and Industrial Products of all nations will be held in buildings specially erected for the purpose in Carlton Gardens, centrally situated in the City of Melbourne. The cost of erecting such buildings, and all expenses incidental to the exhibition, will be defrayed out of funds voted by the Parliament of Victoria.

The fact that Australia has been represented at all the great exhibitions of the world since their inception in the year 1851, and the advance she has made in productive industry, the extent of her commercial relations, and the high position to which her imports and exports have attained, indicate that she has now reached the period when she may invite the great manufacturing countries to send the most complete products of their skilled industry to a people who are in a position to become good customers, as well as generous competitors.

A few statistics upon this head will show the great importance of the trade of Australia. In the year 1876, the latest date for which the full returns are available, the commerce of Australia amounted to a total of nearly $463,000,000; the imports of Victoria, the colony of which Melbourne is the capital, being $78,526,000, and the exports $71,000,000. In the same year Great Britain sent to Australia her manufactures and products to the value of $92,074,500. The United States during the same year sent to the value of only $7,000,000. We think it is not too much too predict that, with a proper representation of American products and manufactures at the forthcoming exhibition at Melbourne, that these figures shall, within the next two years be increased to $25,000,000. Australia now ranks third amongst the export markets of Great Britain, and it is expected that before very long, it will be a larger customer than Germany, which now stands second.

Melbourne is readily accessible from all the settled districts of Australia, and there is constant steam communication from New Zealand, Tasmania, and the islands of the South Seas.

Mr. Pickering has given much attention to international exhibitions, having been actively engaged at the Paris Exposition of 1867, that of Vienna in 1873, our own Centennial in 1876, and the Paris Universal Exposition of 1878, during the whole time each of these exhibitions were in progress. We cannot too strongly urge our machinery manufacturers to be represented at Melbourne this year. On another page will be found specific regulations for exhibitors.

Auxiliaries to Practical Skill.

It is related that a Brooklyn parent presented his daughter a handsome new watch on the occasion of her birthday. One night, after it had been running about a week, the girl forgot to wind it, and in the morning all was quiet and motionless within the glittering case. Thinking she had used the watch carelessly, and that something was broken, she hied at once to a prominent jeweler, and asked him to look at it and see what was the matter. The jeweler opened the case, squinted at the works through a magnifying glass, and told her that the watch was very dirty and needed cleaning, which would cost $2.50. Next, she applied to another jeweler, who put on a wise look, examined the time keeper, and declared that the hair spring was broken and the watch in need of careful cleaning, the cost of putting it in good order being $4.00. Returning home, she consulted her father, who, unable to discover what was the matter, took it to the jeweler from whom it was purchased. This individual took a key, wound it up, and the watch commenced running all right.

Cases almost as ridiculous are daily occurring in steam engineering. From the beginning of cold weather last fall, up to a recent date, the Utica, N. Y., station house, which is heated by steam, could not seemingly be kept in a comfortable condition for officers and prisoners. A roaring fire was kept under the boiler, and the coal pile melted away at an unusual rate, but a surprisingly small quantity of steam was generated; the teeth of the tramps and bummers chattered with cold, as they took possession of their night's lodgings, and roundly did they curse the dispensers of municipal hospitalities. The local newspapers devoted considerable space to discussing the matter, and once or twice the question was taken up by the Common Council, drawing forth much eloquence, but no further enlightenment as to why the caloric was not driven into the water. Finally the individual who occupies the double position of janitor and chief engineer of the steam apparatus, stumbled upon a tube cleaner and was immediately seized with a bright idea to clean the tubes which had become clogged up by soot and cinders, not having been scraped out since the building was erected. He did so, and a great change took place. Both officers and guests rested in comfort. Less coal was used, and the heat, instead of rushing out the chimney, went where it would do the most good.

The lesson to be drawn from these incidents is obvious. The exercise of a little good common sense will often help a man amazingly, whether he is skilled in his business or not. If it were better exercised by some parties who use steam boilers, they would be richer and happier.

Dividing the Responsibility.

For some time past the daily papers have teemed with statements of fact and inference regarding the methods of various gangs of swindlers, who haunt the cities and towns, and make a business of victimizing innocent country and city folk alike. Whether offering to send an $8 dictionary for 27 cents, to furnish an elegant watch or gold-mounted revolver for one-fifth of its cost, or to enable their confiding dupes to make $1,000 in a stock-gambling or lottery transaction, out of an investment of $10, their offers bear the plainest marks upon their face of being attempts at fraud.

Recent investigations have shown that a single individual in this numerous clique of robbers, has cleared for a year or two past an average of $22,000 per month as his share of the profits. But what are the methods and agencies that enable these undisguised thieves to accomplish such results?

The answer is one that should come home to every newspaper, and to every reader of newspapers. It is plain, that, relying wholly upon the circulars which they are able to address and send through the mails to persons whose names they may be able to procure, these swindlers might accomplish *something* in the way of profitable results. But circulars coming in this way reach mostly heads of families with whom they would naturally have little weight, and would seldom be handed over to the younger folk as deserving notice.

The real secret of their success lies in the boldly displayed advertisements and announcements in the newspapers, which meet the eyes of the ignorant and confiding at every turn, and which are all the more dangerous, because appearing in respectable journals. What papers it is, whether those devoted to literature, science, mechanics, or news, that afford this active assistance to thieves, every publisher knows, and every reader may know, if he chooses. The evil has become so open and widespread, that unhappily only a very slight examination is needed to identify any journal which thus chooses to pervert its columns.

It will be conceded that newspaper publishers, as a class, possess a fair average of intelligence, and it is plain, therefore (especially in the face of such disclosures as have become so notorious of late), that, in admitting swindling offers of this kind to their columns, they compromise either their honesty or their intelligence. The house owner who deliberately leases a building for purposes known to be immoral makes himself, to all the intents and purposes of decency and morality, a participant, or silent partner, in the business therein carried on. And, in like manner, the newspaper which

wilfully chooses to make its columns a decoy for thieves, whether paid for its assistance at the rate of twenty cents or one dollar per line must be content to bear its share of the infamy of the transaction.

The New "School of Applied Science."

The magnificent bequest made by the late Leonard Case, as an endowment for the proposed "Case School of Applied Science," at Cleveland, Ohio, if carried out in the spirit of the testator's will, opens up a wide range of possibilities. Numberless gifts have been made to colleges and universities, teaching the dead languages, mathematics and the ordinary branches, but, few of those who desire to benefit their kind in this way have ever seemed to regard mechanical, mining and civil engineering and kindred branches, as worthy of either notice or support. Yet it is these studies, and the industrial progress that results from proficiency in them, that have given, and are to give, our country her best claim to a high place among the nations. The West needs just such a school, and it is to be hoped that the direction and business management of the proposed institution will be confided to hands worthy and able to carry out such a noble bequest in the manner intended by the testator.

The pressure of other matter upon our space has prevented earlier notice of the banquet which was given, a few weeks since, to Alexander Gordon, Esq., manager of the Niles Tool Works, Hamilton, Ohio, by his associates in the works and other gentlemen, upon the occasion of his thirty-ninth birthday. In response to a toast, Mr. R. C. McKinney, Secretary of the Company, stated that, even during the dull times, now so happily past, the shop had paid out more than half a million dollars to workmen, the bulk of this large amount passing directly into the hands of local merchants in exchange for goods purchased. The company assembled were readily enabled to recognize the probable profit accruing to the community from the bare existence of such a manufacturing concern in their midst.

Notes of the Press.

(From the Bulletin of American Iron and Steel Association.)

Among the American journals devoted to special trade or industrial interests we know of no one which has so steadily advanced in sterling worth and importance as the New York AMERICAN MACHINIST. It is one of the brightest of our weekly exchanges, and we do not see how any mechanic engaged in the various reproductive iron industries can afford to be without it. The subscription price is only $3.00 per annum. Publication office, 96 Fulton street, New York.

(From the Railway Age.)

The AMERICAN MACHINIST of New York, is a very creditable weekly representative of the mechanic arts and is fast making a high reputation.

(From the Welcome Visitor, St. Catharines, Ont.)

The AMERICAN MACHINIST is the name of a finely-illustrated sixteen-page weekly paper, a copy of which has been received from the publishers. In view of the rapid extension of manufacturing industry in Canada, the MACHINIST should have a large circulation among our mechanics, who will find it to be just the paper they need.

(From the Cohoes Register.)

The AMERICAN MACHINIST is one of the very best papers devoted to the interest of iron workers.

(From the Newmarket Advertiser.)

Every machinist should subscribe for the AMERICAN MACHINIST.

(From the Tyrone Herald.)

We cheerfully recommend the AMERICAN MACHINIST to mechanics, machinists, engineers, founders, pattern makers, blacksmiths, and all others interested in mechanical trades. It is issued by the American Machinist Publishing Company, 96 Fulton street, New York. Terms $3.00 per annum.

(From the Cohoes Leader.)

The AMERICAN MACHINIST is an excellent work for men of a mechanical turn of mind.

(From the Republican Watchman.)

The AMERICAN MACHINIST deserves more than passing attention. This publication, while comparatively new to most readers—being now in its third year—has attained a wide circulation and a high standing among those to whose cognizance it has come. Very cordial and appreciative recognition has been given it by the press. It is a large, handsomely printed and profusely illustrated journal, and cannot fail to benefit any family into which it may bring its stores of useful reading.

(From the Kennebec Reporter.)

"The AMERICAN MACHINIST" is the title of a very neatly printed, finely illustrated, and well arranged paper that reaches our table this week, of particular value to every one, young or old, interested in mechanical subjects, especially all Machinists, Engineers, Founders, Boiler Makers and Blacksmiths. It is furnished by the American Machinist Publishing Company, 96 Fulton Street, New York, and is a sixteen-page sheet furnished for $3.00 per year. Among its contributors are some of the best inventive and practical talent in that line to be found in the country. All our manufacturers should have it.

Business Specials.

Forty cents a line for each insertion under this head.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co., New York, or the author, Manchester, N. H.

Lathe Attachments for Milling Plane and Irregular Forms; Taps and Reamers fluted and Gears cut without removing from the lathe centers. For extended description, see AMERICAN MACHINIST, Sept. 13 and 20 issues. Send for circular to Wm. Main, Piermont, N. Y.

Models made to order; experimental machinery built; parts of models supplied. H. B. Morris, Ithaca, N. Y.

Steel Stamping Figures and Dies.—1-16" to 1-8" Figures, per set, $1.00; 1-8" Letters, $3.00. American Tool Co., Cleveland, O.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) S. H. W., Cheboygan, Mich., writes: Please inform me how to case-harden with prussiate of potash? *A.*—Pound the prussiate of potash fine, then heat the article in a hollow fire or furnace, if possible, until it is a low red, but not enough to raise a scale; sprinkle the potash upon it with an iron spoon, and replace the article in the fire, at the same time turning it, so that the melted potash may reach all parts alike. The potash should be applied a number of times, in order to keep the article well covered. This process should last from ten to fifteen minutes, as by prolonging this process the case-hardening will be made deeper. At the expiration of the time, the article should be quickly taken from the fire and plunged into cold water.

(2) G. P., Portsmouth, N. H., writes: Please explain the difference between high pressure and low pressure engines, also, what makes the difference? *A.*—High pressure engines are of that class in which the steam after having done its work is exhausted, or allowed to escape into the open air, and is thereby thrown away. Low pressure engines are of that class in which the steam, after having done its work in the cylinder is exhausted into a separate chamber or condenser, where the steam meets small jets of cold water. The steam is thus condensed, and the water of condensation is removed by means of an air-pump. A vacuum is thus formed, which is utilized on one side of the piston, while the steam presses upon the other, alternating with each revolution of the engine. It will be understood from the foregoing that in the high pressure engine the steam does all the work, while in the low pressure engine a large portion is done by the pressure of the atmosphere. Low pressure engines work with a pressure from 30 lbs. per square inch and downward, while high pressure engines work with a pressure of 30 lbs. and upwards, average pressure carried is about 60 lbs. per square inch.

(3) G. M. B., New London, Conn., writes; Will you please inform me how to "blue" steel articles, such as screws and parts of gun-locks? *A.*—This process consists merely in subjecting the steel to heat. The dark blue is produced at a temperature of about 600°, and the blue at about 550°. The steel must be finely polished on its surface, then subjected to a uniform degree of heat. Fine work is generally covered with wood ashes, but for ordinary work make a box of sheet iron, fill it with sand and subject it to a steady heat. Immerse the articles in the sand and carefully watch them, and when the right color appears they should be taken out and immersed in oil.

(4) A. G. F., Erie, Penna., writes: In our shop we have to do a great deal of counter-boring, and nearly every job requires a special tool, from the fact that the end or tip of the boring tool will not fit the holes, being either a trifle too large or small. Owing to this difficulty it is a very expensive process. Is there no way to overcome this objection? *A.*—Yes. Make the tips ¾" in diameter on all counter-bores from ⅝" to 1" in diameter, and ½" in diameter on those from 1" to 1¼" in diameter, and ⅝" in diameter on those from 1¼" to 2" in diameter; rings are to be used which fit tight upon the tips, and may be readily changed for fitting holes of different sizes. The cutting edges may also be made thinner, as they will then cut faster and easier. This plan is used extensively in some shops.

MANUFACTURES

Champlin & Spencer (Machinists' Supplies), 154 Lake Street, Chicago, Ill., write us: Business just now is quiet, owing to inventories being taken and yearly settlements made; but trade has been good for the past four months, and the prospect is fair for a brisk trade this spring. Goods in this line have advanced, and we are in receipt of notices of advance every few days, but we think that those that have advanced will remain at present prices. A great many new industries are starting in the West, and old ones are enlarging their capacity, in order to keep up with orders. Our great trouble has been of late to get goods from the Eastern manufacturers, in some cases having to wait three months, when ordinarily we could get them in two weeks. We trust you will find this information of service, and wish you success with your valuable paper (which we think is the best of its kind in the world).

Wm. Allen & Sons, Worcester, Mass., (Victor Feed Water Heater and Purifier), write us: In answer to your favor, business with us has been very brisk to over-crowding, and is still good. Looks promising for the New Year, and higher prices must undoubtedly rule. We are increasing our facilities, and look forward to greatly increased trade this year. Wishing your paper every success, we remain, &c.

W. B. Osborne writes us from Indianapolis, Ind.:

Of the past season, it can be said, to have been one of the best for the agricultural shops that they have ever experienced. All of them were run "full time," and some (I might say, the whole of them), made from three to five hours over time. There are quite a number of farm engines built here, and one firm who built a number running up into the hundreds (in connection with their regular trade), could have sold a third as many more, if they had had them. The same firm built twenty of the Davison Patent Traction Engines, used for threshing, plowing, road work, etc., and it is rumored that the patentees have given a Chicago firm an order for fifty more for next year's trade. The Atlas Works here are now quite busy, and give employment to a large force of men on their popular Atlas-Corliss and Portable Engines. The Quaker City Works and Eagle Machine Works (two of our principal shops) are also rushed with work; the latter's trade has been so good this winter as to prevent them building their usual stock work. Machinists' wages here vary from 15c. to 25c. per hour in private shops, but are somewhat higher in railway shops.

A corporation called "The Chilled Car Wheel Grinding Company" has been organized at Carson, Nevada, for the purpose of manufacturing and licensing machines for grinding car wheels.

A correspondent writes us:

The Johnston Ruffler Co. and the Ottumwa Iron Works, Ottumwa, Iowa, (one and the same firm) employ 19 machinists, 3 blacksmiths, 10 moulders, 2 pattern makers, about 135 hands in all, in the manufacture of sewing machine attachments, engines, mill machinery, &c.

The Stearns M'f'g Co., Erie, Pa., (Saw Mills, Engines, etc.,) want two or three first-class machinists, who are used to the Corliss style of engines. They want men competent to work in shop building, and also to take engines out and start them up.

C. E. Marston, Dover, N. H., is to build a new machine shop in connection with his foundry.

The Canada Wire Company, of Montreal, is to apply for incorporation. Barbed wire for fencing will be the principal article of manufacture at the outset.

About $70,000 has been subscribed for the erection of a beet-sugar factory at Franklin, Maine, and over 400 acres of land are pledged for the first crop.

The cable betwen Port Natal and Zanzibar, along the east coast of Africa, was completed on the 27th ult., and the first direct message to this country was received in New York a few days since. It was an order from Port Natal for goods of American manufacture to the value of over $10,000.

In the spring Oldenburg & Baltes, Milwaukee, Wis., will build a new furniture factory, that now occupied not being of sufficient capacity to accommodate their business. The new building will be of brick, four stories in height, with a street frontage of not less than one hundred and forty feet and possibly one hundred and sixty. The cost will be $20,000. A new boiler and engine will be put in, also considerable new machinery. When completed the factory will give work to one hundred and seventy-five men—about double the number now employed.

The erection of works in Chicago for the manufacture of steel tire paper wheels is now an assured fact. The plans are now ready. The grounds selected are said to be on the line of the Chicago, Rock Island & Pacific road. The capital stock of the company is $1,000,000, of which $600,000 is taken by Eastern parties and $400,000 by local capitalists.

Cope & Maxwell M'f'g. Co., Hamilton, O., shipped in November last three car loads of pumping machinery to Colorado. In December they shipped two car loads of steam pumps to San Francisco, Cal. They have six Isochronal pumping engines now under way for the same place, and two more for the Connellsville, Pa., coke region, besides numerous small pumps for different sections of the country. They are now working sixty workmen on steam pumping machinery alone. Prospects for trade were never better.

The round-house to be built by the Cincinnati Southern Railway Company, at Chattanooga, will be similar to the one at Ludlow, Ky. The front will be 96 feet, and the circumference of the whole will be 824 feet. When completed it will contain 24 stalls for engines, but for the present, room for eight engines only will be finished.

The average pay of the freight engineers on the Pittsburg, Cincinnati & St. Louis R. R. for the past six months has been $123; on the Indianapolis, Cincinnati & Lafayette, $120, and on the Cleveland, Columbus, Cincinnati & Indianapolis, $122.

The Missouri Car & Foundry Co. has about finished a new shop in the southern part of St. Louis, and has transferred the work there from the shop at Cambridge City, Ind., which it has leased since the burning of the old shops in East St. Louis.

The Cambria Iron Company, of Johnstown, Pa., have ordered a second Porter-Allen engine, which is to be a duplicate of the 40 inch engine, lately erected at their works, which is driving their steel rail train. The Gautier Steel Company have also ordered a second one of these engines.

J. F. Holloway, Pres't. of the Cuyahoga Works, Cleveland, Ohio, writes us:

I am inclined to think that machinists and iron workers generally, want something to brace them up for the business that is ahead of them. For the few years past they have been well situated, to appreciate the lines of Old Hudibras (improved) when he says:

"What troubles do environ
Men that handle hot iron."

I may say we are quite busy, and have considerable work ordered. We are having quite a boom in blowing engines for blast furnaces. Have just completed the fourth engine from our new pattern of 84" blowing cylinder, and have four more under way. Have also in hand a large compound marine engine for the Lakes, and one of our largest sized Steam Helve Hammers, together with an unusual amount of repairing.

A Springfield, O., correspondent writes: The Champion Bar and Knife Co., of this place, broke one of their large jack-shafts, (7 inches diameter,) last week, and it will take two weeks to repair the mischief.

Armington & Sims, Lawrence, Mass., are building a 200 horse-power Lawrence engine, new automatic cut-off, for the Everett Mills of that city. Have just shipped one of their 35 horse-power to Golding & Co., Boston, Mass. They are also building nine of them of smaller sizes.

The Carbon Iron Company of Perryville, Carbon county, Penn., are to build another foundry. About 500 hands will be employed when the structure is complete.

The use of the lowest grade of Bessemer steel for the purpose of making edge tools has, generally, been considered impracticable. One of the latest books published on shop processes says: "The various recipes for mixtures for restoring burnt steel are worthless." We witnessed, and participated in, some experiments, a few days since, and also examined and tested some specimens, which led us to believe that few of the men who are accustomed to work steel, at the present day, fully understand the nature of the material, or how to secure uniform results. The specimens referred to consisted of a razor made from the lowest and cheapest grade of Bessemer steel, which cut as well, apparently, as those made from a finer and more costly material. We also tested a knife, made from the same grade of steel, by cutting across the grain of a dry black walnut knot, the edge of the knife being sprung, for the time being, by the pressure put upon it, until it seemed as if it must inevitably crack or break, but it did not; neither did its cutting properties seem to be at all impaired. We also examined and tested numerous other specimens, such as saws, springs and carpenters' chisels, all made from the same steel.

The steel from which these articles were made had been dipped in "Steeline," a compound intended to restore steel that has been burned, making it better than before, and to improve the quality of all kinds of steel. For annealing purposes alone, this compound is excellent, as it makes the steel as soft as iron and removes all hard spots. A few days since, we were assured by a firm of unquestionable reputation, who are using this compound for annealing and treating large and small dies, that it is likely to work a revolution in the manufacture of steel articles and tools.

The inventor claims that, by burning the steel and subsequently dipping it in this compound, the impurities are removed, while the metal acquires a uniform degree of hardness or softness throughout, and that this is an easy and inexpensive way of accomplishing these results. Burning the steel removes a portion of the carbon contained in it, while dipping it into "Steeline" recarbonizes it, purifying it and leaving it free from liability to crack. Exactly how and why this result takes place is a secret even to the inventor of the process, and is a question that has excited much discussion. The manufacturers are Bauer & Co., 96 Greenwich Avenue, New York.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 15, 1880.

Market for supplies this week rather more steady than heretofore, most of the manufacturers, who intend changing prices just at this time, having made them earlier in the month. Inventory-taking interferes somewhat, but general business is good for the time of year.

Reported that Singer, Nimick & Co.'s best tool steel has advanced ½c. to-day, making present price 13½c.

Raw hide hammers are being advanced, both list and discount, but prices are not yet made public.

Hicks' Belt Studs have advanced within a few days.

Chucks have not yet moved upward, but it is thought must do so soon.

C. W. Le Count, South Norwalk, Conn., writes us that he does not contemplate any change in prices of his goods at present.

Finished small tools have not yet made any upward movement, but it is thought the recent advanced prices of labor and material must be felt in these goods soon.

Most brands of American files have advanced about 10 % recently, discount to consumers being now about 25 %.

Importers of English files talk higher prices before long.

A. F. Prentice & Co's 3¼ ft. Engine Lathe, that has been selling lower, is now sold to consumers at $125 net.

Goodnow & Wightman's 3 ft. Engine Lathe is now selling at $100 net.

Machine Screw manufacturers have not arched their backs yet, but are expected to do so soon.

Wrought Iron Pipe can now be bought in small quantities at a lower price than in large lots, showing feeling to be in favor of higher prices.

It is stated on authority that Twist Drills will not be advanced.

Iron Fittings (both steam and gas) have advanced about 10 % within three days. Brass Fittings unchanged.

Black and Tinned Iron Rivets are advanced to discount 30 % in papers, and 10 % in bulk.

Iron Review.

NEW YORK, Jan. 15, 1880.

Actual quotations this week remain unchanged, but higher prices are expected to take effect soon. Refined iron quoted here at 3 5-10c. is held in Philadelphia at 3 6-10c., and it is believed this market will follow suit with a further advance. Well informed parties predict 4c. as the figure by March next on this iron. Demand is good, and many parties who have been holding off in anticipation of lower prices are now buying freely at the present rates.

Pierson & Co., 24 Broadway, New York, furnish us the following quotations out of store, under date of Jan. 15, 1880.

No. 1, X Pig, $35 to $36 per ton; Iron Rails, $50 to $60, according to weight; Old Rails $38 to $40; Fish Plates, 3¼c. per lb.; Railway Spikes, 3¾c.; Bolts and Nuts, 4½c.; Common Bar Iron, 3 2-10c., basis from store; Refined, 3½c., basis; Ulster, 4 2-10c., basis; Machinery Steel, 7c.; Best Tool Steel, 13c.; Norway Bar Iron, 6c.; Norway Shapes, 6½c.; Nail Rods, 6½c.; Sheet Iron, 4½c., basis; Angle Iron, 4c.; Tee Iron, 4½c; Band Iron, 4c.; Hoop Iron, 4 3-10c.; Horse Shoe Iron, 4c.; Hot Polished Shafting in lengths, 2 ft. and longer, 7 to 8c., according to size; Small Black Rivets 40% off in papers, 25% off in bulk.

Store prices to-day of boiler-makers supplies: Flange, 6c.; C. H. No. 1 Shell, 5c., C. No. 1, 4½c.; Boiler Tubes, 5 & 5% discount; Sheets, 5c.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of Jan. 15th, 1880:

The Metal Market is active, strong, and excited; the volume of business transacted since our last is enormous. At present there are no indications of any abatement. London Cables, £96. Quotations at this writing merely nominal. Banca Tin, 25½c; Malacca and Straits, 24c.; Billiton and Australian, 23¾c.; "Lamb and Flag," 23c.; Pig Lead, 6c.@6¼c., as to lots; Antimony—"Hallett," 18c.; "Cookson," 20c.; Ingot Copper, 22c; Spelter, 6½c. for domestic, 6⅝c. for Silesian; Nickel, $1.25; No. 1 Solder, 13c.; Half-and-half, 15c.

Situations Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

Manufacturers requiring the service of a Mechanical Engineer and Draughtsman, who can take the lead in designing and constructing first-class Steam Engines and Mill work, will please address A. P., AMERICAN MACHINIST, 96 Fulton Street, New York.

Wanted a situation by a competent Mech. Eng. and draughtsman as Supt. of Machine Shop or draughtsman, address A. E. W. care American Machinist, 96 Fulton Street, New York.

Parties desiring a good practical and reliable machinist as foreman who understands managing help and is well qualified for general jobbing or specialties, can find one by addressing A. S. Granville, Lawrence, Mass.

WANTED—A situation by an able and active mechanic and draughtsman of many years experience. Is thoroughly conversant with the Corliss system and the construction of special tools. First-class references given if required. Address A. P., American Machinist, 96 Fulton Street, N. Y.

WANTED—Situation as foreman over a Machine Shop by a well qualified man. Address W. Fitton, Mount Washington, Bedford Street, Pittsburgh, Pa.

TWISS
Vertical Engine.
For all light, quick work. Size, 2 to 20 horse power. Also,
Special Yacht Engines
And the Twiss Patent Automatic Engine.
Manuf'd by NELSON W. TWISS,
NEW HAVEN, CONN.

WANTED.
Portable Engine from 4 to 8 H. P. Engine Lathe, 24 to 30 in. swing, 12 ft. bed. Must be in fair order and cheap. John W. Edwards, Box 492, New London, Conn.

MACHINE
DRAWING COPIES
TEN CENTS EACH.
Send for List of Plates, now ready, and Catalogue of Books for Practical Engineers.
E. & F. N. Spon, 446 Broome St., N. Y.

The Workshop Companion.
A handy and useful dictionary of practical information for **Engineers, Machinists, Draughtsmen and Mechanics**, containing useful and reliable recipes, rules, processes, methods, practical hints, &c. **NO** medical or cookery recipes. 164 pages. This book will be sent, post-paid, on receipt of Twelve 3-cent postage stamps.
T. P. PEMBERTON,
249 Duffield St., Brooklyn, N. Y.

PATENT NICKEL-SEATED
"POP" SAFETY VALVES
FOR
STATIONARY, LOCOMOTIVE, MARINE and PORTABLE
STEAM BOILERS.

Our Patents cover all Safety Valves utilizing the recoil action of steam, and familiarly known as "Pop Safety Valve."

☞ Purchasers, beware of infringements of our Patents.

Capital, $100,000.
The Consolidated Safety Valve Co.,
Office and Manufactory,
51 & 53 SUDBURY ST., BOSTON, Mass.

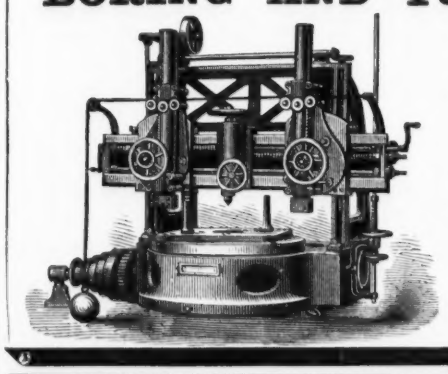
SEND FOR PAMPHLET. THE FAR-FAMED AMERICAN LUBRICATOR. TEN THOUSAND IN USE.
AMERICAN LUBRICATOR CO.
DETROIT, MICH. U.S.A.

RICHARD DUDGEON,
24 Columbia Street.
NEW YORK,
Maker and Patentee of
IMPROVED HYDRAULIC JACKS,

Punches, and Roller Tube Expanders,
AND
DIRECT ACTING
Steam Hammers.
Communications by letter will receive prompt attention.
Jacks for Pressing on Car Wheels or Crank Pins made to order.

NEWARK STEEL WORKS.
BENJAMIN ATHA & CO.
MANUFACTURERS OF
CAST STEEL
WE MAKE GRADES OF STEEL SPECIALLY ADAPTED TO THE MANUFACTURE OF LATHE TOOLS, CHISELS, TAPS & DIES
BENJ. ATHA. NEWARK, NEW JERSEY. J. ILLINGWORTH.

BORING AND TURNING MILLS.



All Sizes: 4, 5, 6, 8, 10, and 12 feet Swings.
PATENTED IMPROVEMENTS.
New Patterns.
MACHINISTS' TOOLS,
The Latest and Best, at very moderate prices.
NILES TOOL WORKS,
HAMILTON, OHIO.

SHEFFIELD, ENGLAND. F. W. MOSS, 80 JOHN STREET, NEW YORK.
(SUCCESSOR TO JOSHUA MOSS AND GAMBLE BROS.)
STEEL and FILES
HAMMERS, ANVILS, VISES, BLACKSMITHS' TOOLS.
WARRANTED CAST STEEL. Specially adapted for Dies, Punches, Turning Tools, Drills, &c.
ALSO, THE WORLD-RENOWNED
IMPROVED MILD CENTERED CAST STEEL,
Specially adapted for Taps, Reamers, Milling Tools, &c.
Warranted Not to Crack in Hardening Tools of Any Size.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

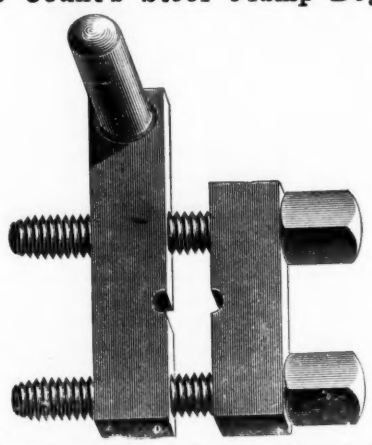
HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files.
"Slim" Saw Files.
"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders,
Vise File Holders.
Stub Files and Holders.
Improved Butchers' Steels.

Manufactory and Offices at **PROVIDENCE, R. I., U. S. A.**

Le Count's Steel Clamp Dog.



These are made from the Steel Bar and hardened all over, as well as the Screws. They will carry all that can be put on them. The tail is Steel, turned and driven into a taper hole. The Screw Head is a ball, and will accommodate itself to a straight or taper piece.

PRICES.

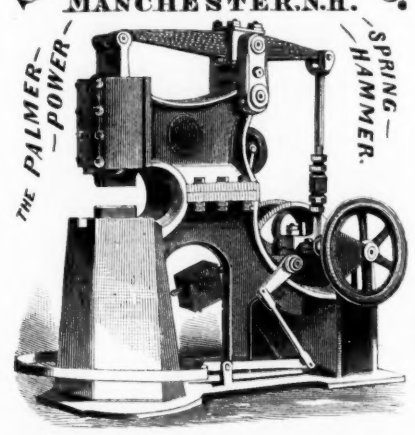
No. 1 opens	1	inch,	- - -	$1.25
" 2 "	1½	"	- - -	1.50
" 3 "	2	"	- - -	1.75
" 4 "	3	"	- - -	2.00

MANUFACTURED BY

C. W. Le COUNT,
SOUTH NORWALK, CONN.

S. C. FORSAITH & CO.

MANCHESTER, N.H.



BOLT FORGING MACHINES,

POWER HAMMERS,

Machinists', Blacksmiths' Tools,

And Wood-Working Machinery

A SPECIALTY.

More than 6000 in Use July 1st, 1879.

The Best **STEAM PUMP** in America.

SIMPLE! POSITIVE! DURABLE! **"THE DEANE."** FOR E ERY POSSIBLE DUTY.

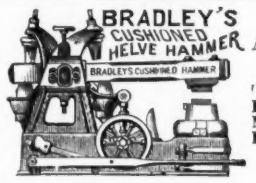
Send for Illustrated Catalogue and Price List.

DEANE STEAM PUMP COMPANY,

Holyoke, Mass., U. S. A.

N. Y. WAREROOMS, 92 & 94 LIBERTY ST.

JOHN H. HARRIS, Manager.



BRADLEY'S CUSHIONED HELVE HAMMER.

Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition, in 1876,

'Being the highest award given any goods of their class in America or Europe.

IT HAS MORE GOOD POINTS, LESS COMPLICATION
MORE ADAPTABILITY, LARGER CAPACITY,
DOES MORE AND BETTER WORK, TAKES LESS POWER
COSTS LESS FOR REPAIRS.

THAN ANY HAMMER IN THE WORLD.

Guaranteed as represented. (Established 1832.)

Branch Office, 22 to 24 & 26 So. Canal Street, CHICAGO, ILL. BRADLEY & COMPANY, Syracuse, N. Y.

TOOL DEPOT.

CHUCKS, VISES, FILES, EMERY GRINDERS, EMERY WHEELS, WIRE STEEL, BRASS, TAPS, DIES, MACHINE, SET & CAP SCREWS, GEAR WHEELS, LATHES SHAPERS, DRILLS, SCROLL SAWS & SMALL TOOLS FOR ALL BRANCHES OF TRADE. SEND FOR CATALOGUE & STATE WHAT KIND OF TOOLS YOU REQUIRE.

TALLMAN & McFADDEN. PHILADELPHIA.

The Rollstone Machine Co.

FITCHBURG, MASS.

Manufacture sixty different machines, embracing all varieties of

NOVEL WORKING MACHINERY.

Send for circulars of any special machines wanted. We also carry a large stock of Second-Hand Machinery. Send for Catalogue.

MACHINISTS' AND FOUNDRY SUPPLIES.

Machinists' Tools, Drills, and Taps and Dies. Also, **Belting and Steam Packing** of all kinds, and a general assortment of supplies for

FACTORIES AND MILLS.

T. B. BICKERTON & CO.
No. 12 South Fourth Street,
PHILADELPHIA, PA.

L. B. EATON,

TOOL STORE,

No. 11 N. 6th St., Philadelphia.

SCROLL SAWS!! SCROLL SAWS!! $3, $5, $8, $11, $13, $15, $21, $22 50. Rogers, Empire, Victor Lester Dexter, Challenge, Fleetwood.

TOOL CHESTS!! TOOL CHESTS!! from 75c. to $10.00, containing from 18 to 61 Tools. Carvers, Gravers.

U. S. ENGRAVING WORKS

"STEREOTYPES & ELECTROTYPES made from Photos or Drawings" — "ORIGINAL DESIGNS AND SKETCHES furnished in the best artistic manner" — "RELIEF PLATES FOR NEWSPAPER AND BOOK ILLUSTRATIONS" — "CHEAP AND SUPERIOR SUBSTITUTES FOR WOODCUTS" — 24 YESEY ST. NEW YORK — SEND FOR ESTIMATES — STATE WHERE YOU SAW THIS

The Huntington Emery Wheel Dresser.

(IMPROVED.)

Invaluable to Users of Emery Wheels.

Thousands in Successful Use

For Truing, Shaping, Sharpening and Removing Glaze from Solid Emery Wheels.

Price $4.00. Send for Circular. C. E. ROBERTS & CO., CHICAGO, ILL.

Machinists' Supplies,

CHAMPLIN & SPENCER,
154 E. Lake Street,
CHICAGO, Ill.

Sole Agents for the Tanite Co.'s Solid Emery Wheels, Grinding Machinery, &c.

Also, agents for **Shepard's Screw Cutting Lathes** Dealers in Morse Twist Drill Co's Goods and small tools for all workers in iron or wood. Send for Catalogue.

Scientific Books.

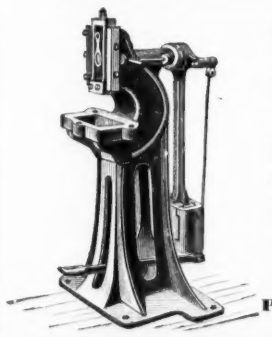
Send 10c. for new Catalogue, 1879, to

D. VAN NOSTRAND,
23 Murray & 27 Warren Sts.,
NEW YORK.

BOOKS FOR SALE.

Rare opportunity to purchase a complete set of the "Encyclopedia Britannica," 8th edition. Twenty-three books, bound in cloth, at $55.00. Also, a copy of The Practical Draughtsman's Book of Industrial Design, from the French, Armengand. By William Johnson, C.E.; 1860, in good condition, cloth, at $7.00. Address, J. F., Office American Machinist.

ASTONISHING POWER in FOOT and HAND PRESSES.



Punching, by foot, *3-4* hole in *5-16* iron 6 inches from edge.

Smaller sizes punch, by foot, *3-8* x *1-4*, and *1* inch by *1-8*, as rapidly as by power presses, at one-half the cost.

Our largest hand machines punch *1* inch hole in *3-8* iron, and shear bar *3-4* x *2* inches at a cut, any length, one man at the lever.

Highest prize, ***The Grand Medal of Progress***, has just been awarded us at the American Institute Exhibition.

Our presses can also be run by steam power.

PEERLESS PUNCH and SHEAR CO.,
52 Dey Street, New York City.

IMPORTANT TO STEAM USERS.

Great Saving of Fuel.

Save repairs and prevent explosion by using the

Peerless Damper Regulator,

which regulates the draft automatically, and controls the steam pressure. In ordering mention pressure. Illustrated Catalogue sent on application.

Price, $38.50.

AMERICAN STEAM APPLIANCE CO.

SOLE MANUFACTURERS,

28 School Street, BOSTON. *13 and 15 Park Row,* NEW YORK.

ALMOND DRILL CHUCK

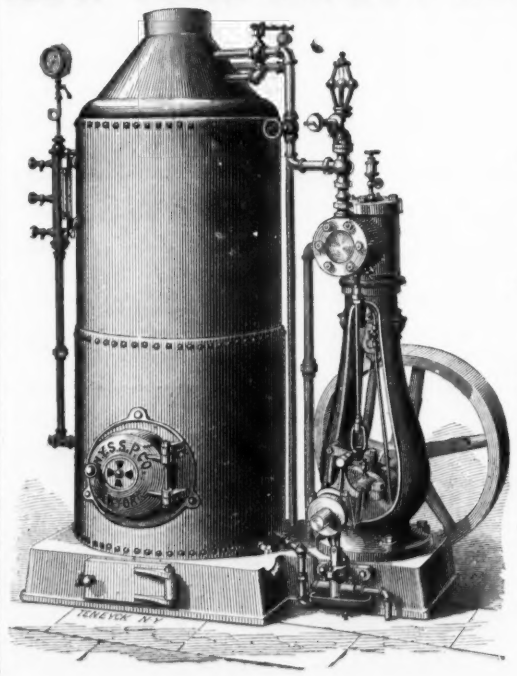
Made of Steel throughout, equal to doing any work required of it—Runs perfectly true.

For sale by all Machinists' Supply Stores.

T. R. ALMOND
84 Pearl St.
BROOKLYN, N.Y

(Cut shows Chuck full size.)

NEW YORK SAFETY STEAM POWER CO.



30 Cortlandt Street,
New York City.

SPECIALTY,
VERTICAL STEAM ENGINES.

OVER 800 IN USE.

Twenty Different Sizes, 2 to 120 H. P.

With or without Boilers.

Many of our Engines have been at work for ten years, giving utmost satisfaction, and having cost little or nothing for repairs.

Rated Power and Surplus Strength.
Accurate Speed and Smooth Running.
Freedom from Breakage.
Reliability, Durability, and General Satisfaction Guaranteed.

We are now quoting lower Prices than ever before.

SEND FOR NEW PRICE LIST.

WANTED FOR CASH.

A second-hand Engine Lathe in first-class condition, swinging from 50 to 70 inches. Address, F. D. Livermore, Rochester, Minnesota.

HALL'S PATENT DOUBLE COMPOUND LEVER CUTTING NIPPERS.

MACHINISTS' SUPPLIES.

Price $1.25.
Sent by mail for 6 cents additional.
Every pair warranted.

Of the many Cutting Nippers heretofore placed on the market, not one has supplied either of the two great needs long felt by all who use them, viz.: 1st. Increased power without a clumsy and expensive increase of size. 2d. That the construction of the Nipper should be such that any damage to the cutting jaw or handle, from wear or accident, could be repaired.

All orders should be addressed to

PETER A. FRASSE & CO., Sole Agents, 95 Fulton Street, New York.

The E. HORTON & SON CO.

WINDSOR LOCKS, CONN.

MANUFACTURERS OF

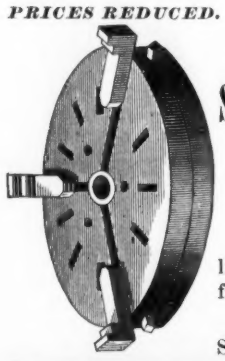
THE HORTON LATHE CHUCK

AND THE

SWEETLAND IMPROVED HORTON CHUCK,

Independent, Universal and Eccentric Combination.

PRICES REDUCED.



April 1st, 1879.

From this date a discount of 30 per cent. will be made from the list price of The Horton Lathe Chuck, and a discount of 15 per cent. from the list price of the Sweetland Improved Horton Chuck.

Soliciting your orders, we are, respectfully yours,

Send for Price List. THE E. HORTON & SON CO.

H. PRENTISS AND COMPANY

Manufacturers of PATENT RELIEVED

Machinists', Blacksmiths' and Gas Fitters'

Taps; Dies, Reamers and Screw Plates, &c., &c.

DEALERS IN MACHINISTS' SUPPLIES.

No. 14 DEY STREET, - NEW YORK.

Address P. O. Box 2187. **PIERSON & CO.** Office, 24 Broadway, N.Y

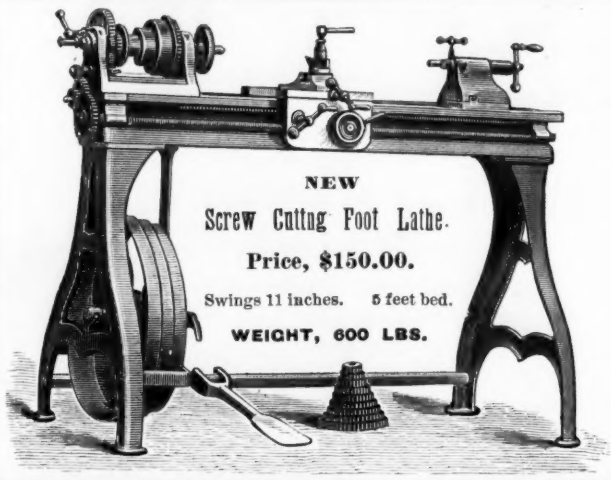
ESTABLISHED 1790.

IMPORTERS AND DEALERS IN

IRON and STEEL of every Description.

Warehouse, 24 & 26 Broadway, and 77 & 79 New Street.

PRICE LISTS FURNISHED ON APPLICATION.



A.F. PRENTICE & CO.

Manufacturers of

Light Machinists' Tools.

Improved Upright Drills, with Lever Feed and Wheel Feed with Quick Return Motion.

Hand and Foot Power Lathes.

SLIDE RESTS.

Special Machinery and Machine Jobbing.

FOOT POWER LATHES A PECIALTY

54 Hermon Street,

WORCESTER, MASS.

Model Engines.

Complete sets of CASTINGS for making small

Model Steam Engines, 1 1-2 in. bore, 3 in. stroke, price, $4; ditto, 2 in. bore, 4 in. stroke, price, $10 same style as cut. Gear wheels and parts of Models. All kinds of small Tools and Materials. Catalogue free. GOODNOW & WIGHTMAN, 176 W shington Street. Boston, Mass.

E. E. GARVIN & CO.

Manufacturers of

Milling Machines, Drill Presses,

No. 4 Milling Machine.

Hand Lathes, Tapping Machines, Cutter Grinders and Wood Planers. Milling Cutters, all shapes and sizes. Gear Cutting and Milling in all its branches.

139-143 CENTRE ST.

Cornell's B'ld'g

NEW YORK.

Send for illustrated Catalogue.

The Hendey Machine Co.

Wolcottville, Conn., U. S. A.

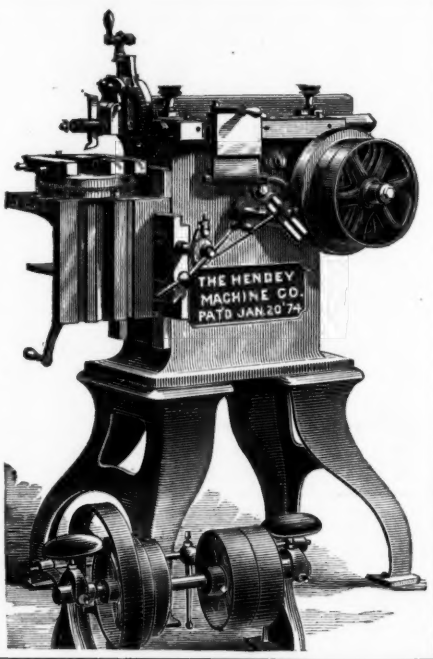
MANUFACTURERS OF THE

MANVILLE PATENT IRON

Planers and Shapers.

24 in. Shapers, 15 in. Shapers, 5 ft. x 24 in. Planers, 3½ ft x 16 in. Planers, 24 in. Amateur's Hand Planers, with Chuck and Centers, 3 ft. x 8 in. Fine Engine Lathes, 5 ft. x 12 in. Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck and Common Clock Lathes.

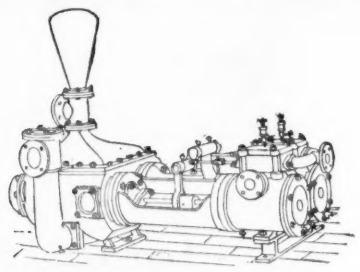
Send for Catalogue giving description of Tools, with names and opinions of users, and mention where you saw this.



W. H. ODELL, ENGINES INDICATED, POWER MEASURED.

BOX 274, YONKERS, N. Y.

STEAM PUMPS.



HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water Street, Boston.

THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water Works Stations.

STEAM PUMPS for all purposes—Duplex and Single Cylinder.

PRICE LIST ISSUED JAN. 1, 1879, WITH A REDUCTION EXCEEDING 30 PER CENT.

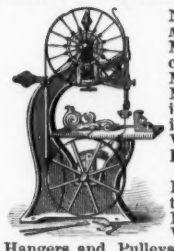
WATER METERS. OIL METERS.

WOOD WORKING MACHINERY

J. A. FAY & CO.,

BUILDERS OF

IMPROVED MACHINERY FOR WOOD CUTTING.



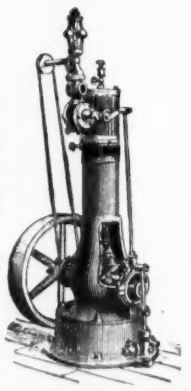
Numbering some 300 different Machines—Planing and Matching Machines, Surface Planing Machines, Molding and Tenoning Machines, Morlising and Boring Machines, Carving and Dovetailing Machines, Shafting and Friezing Machines, Horizontal and Vertical Boring Machines.

Improved Variety & Universal WOOD WORKERS.

Band, Scroll, Ripping and Cutting-off Saws, Band and Circular Resawing Machines, Spoke and Wheel Machinery, Shafting, Hangers and Pulleys, etc., etc. Original in design, simple in construction, perfect in workmanship, saves labor, economizes lumber, and its productions are of the highest standard of excellence. *Send for Circulars and Prices.*

J. A. FAY & CO., Cincinnati, Ohio, U.S.A.

Vertical and Yacht Engines.



The Rowland

Vertical Engine.

LARGE WEARING SURFACES.

Simple in Construction.

Reasonable in Price.

Send for Circular.

F. C. & A. E. ROWLAND, Engineers,

NEW HAVEN, CONNECTICUT.

TRADE GODDARD MARK

THE

Goddard Emery Wheel,

E. A. GODDARD,

Gen. Sales Agent.

ALSO AGENT FOR

AMERICAN TWIST DRILL CO'S

Emery Grinders.

DEALER IN

MACHINISTS' SUPPLIES.

Warerooms, 176 FULTON STREET, NEW YORK.

PRENTISS PATENT VISES,

ADJUSTABLE JAWS,

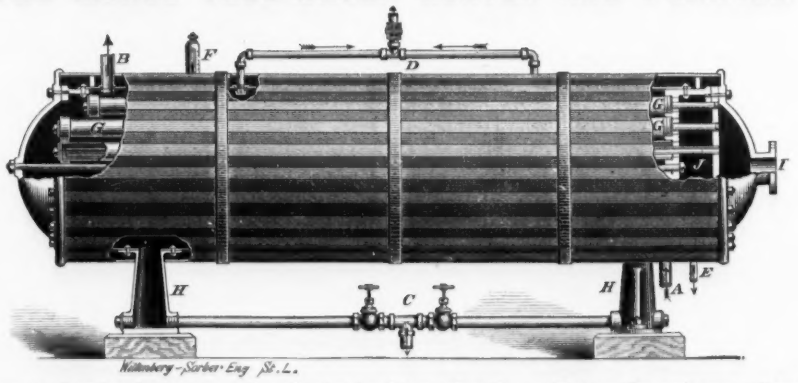
Stationary and Patent Swivel Bottoms,

Adapted to all kinds of Vise work.

HALL M'F'G CO., 23 DEY ST., NEW YORK.

SEND FOR CIRCULAR.

THE MORSE FEED-WATER HEATER AND PURIFIER.



Guaranteed to be the most perfect device in the market for utilizing the exhaust of steam engines. For further particulars, address

E. L. MORSE, Mechanical Engineer, 313 Olive Street, St. Louis, Mo., or J. F. WANGLER, St. Louis Boiler Works.

Stoves and Fire-Place Heaters,

COMBINING

THREE THINGS IN ONE APPARATUS:

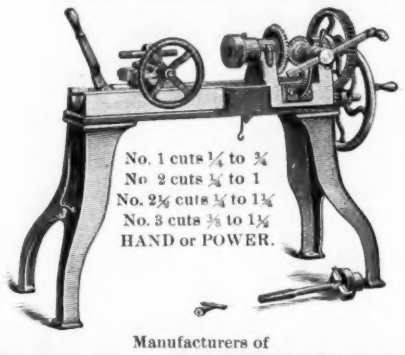
Open Fire, Close Stove, Warm Air Furnace.

Send for descriptive catalogue and testimonials from highest scientific and practical authorities in this country.

OPEN STOVE VENTILATING CO.

78 Beekman St., New York.

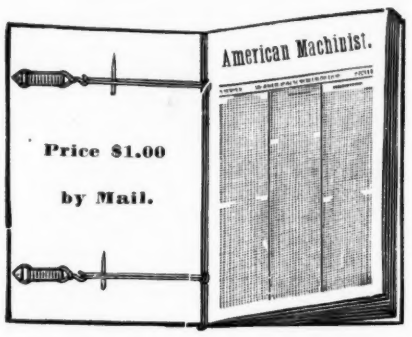
BOYNTON & PLUMMER.
WORCESTER, MASS.



Manufacturers of
BOLT CUTTERS,
Upright and Horizontal Drills,
For Blacksmiths' and Carriage Makers' Use.
Illustrated Catalogue furnished on application.

PATTERN AND BRAND LETTERS.
PRICES REDUCED.
VANDERBURGH, WELLS & CO.
Printers' and Engravers' Warehouse,
Corner Fulton and Dutch Sts.,
NEW YORK:

Monitor Binders
FOR THE AMERICAN MACHINIST.



Readers should preserve their papers in neat, stiff covers like the above. The name American Machinist is stamped on each in gilt letters. Address
American Machinist Publishing Co.,
96 Fulton Street, New York.

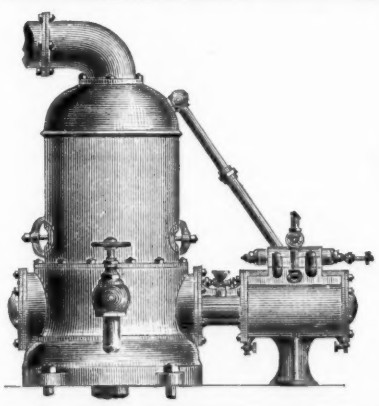
BRAINARD
Milling Machine Co.
Standard Universal Machines,
Index Machines,
Plain Machines,
Mill Grinding Machines,
36 & 38 OLIVER STREET,
BOSTON, MASS.
Works at Hyde Park, Mass.

PRESSED STEEL
GEARING
BEST AND CHEAPEST.
J. COMLY, Lincoln Park, N. J.

JOHN ADT,
20, 22, 24 and 26 Artisan St., New Haven, Ct., U. S.
Automatic Machines,
For Straightening and Cutting Wire of all Sizes to any Length.
Automatic Machines for cutting and forming wire in various shapes. Send for circulars.

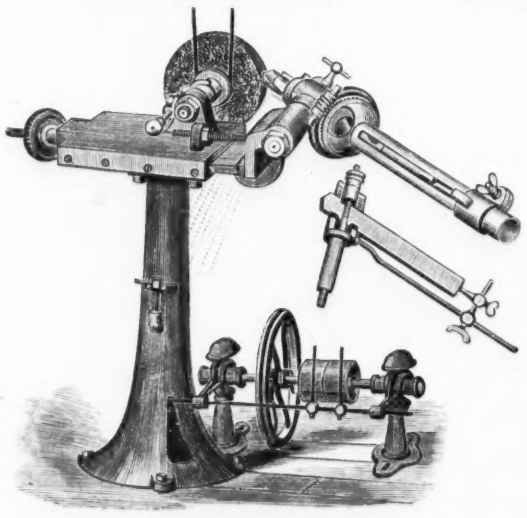
STEAM AND HYDRAULIC ENGINEERING.
FRANK H. POND, M.E.
CORRESPONDENCE SOLICITED. ST. LOUIS, Mo.

P. BLAISDELL & CO.
MANUFACTURERS OF
Machinists' Tools,
Worcester, MASS.



20 Per Cent. Saving in Fuel,
25 Per Cent. Increased Power
BY ATTACHING
HAMILTON'S INDEPENDENT AIR PUMP
AND CONDENSER
TO YOUR ENGINE.
Manufactured only by
SAWTELLE & JUDD,
HARTFORD, CONN.

Eddy's Twist Drill Grinder,
MANUFACTURED BY
WM. H. EDDY, - WORCESTER, MASS.



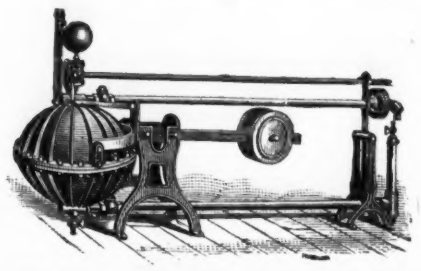
This Machine grinds drills of any size, either crooked or straight, to the same shape as the best machinists do by hand.

It enables the operator to make the cutting edge or lip of the drill thick and strong, so it will not crumble away in drilling, also to make the lip true with the twist or outside surface.

One chuck holds all sizes of drills.

☞ Drop a postal for price and full particulars.

THE ALBANY STEAM TRAP.



This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes.
Apply to
Albany Steam Trap Co.
ALBANY, N. Y.

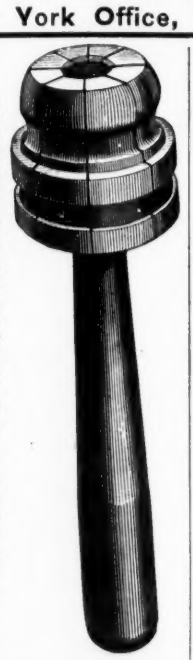
ESTABLISHED 1848.
WILLIAM SELLERS & CO.
PHILADELPHIA.
Machine & Railway Shop Equipments

Shafts,
Couplings,
Hangers,
Pulleys,
Mill Gearing,
Etc.

Lathes,
Planers,
Drills,
Shapers,
Bolt Cutters,
Etc.

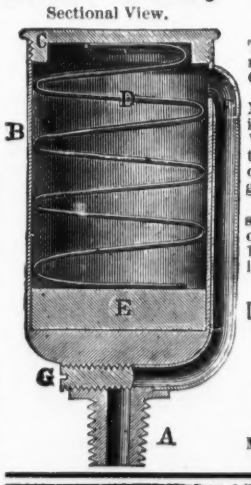
Railway Turntables & Pivot Bridges. Gifford Injectors, Sellers' Improvements
NEW PATTERNS. SIMPLE, EFFECTIVE
New York Office, 79 Liberty Street.

THOS. PROSSER & SON,
15 Gold St., NEW YORK.
"Prosser" Boiler Tube Expanders
STEEL SCREW PUNCHES, TUBE BRUSHES, &C.



WONDERFUL
PUNCHING.
D. L. KENNEDY'S
Spiral Shearing Punch.
THE
DRILL
AND REVOLVING CUTTER
SUPERSEDED,
AND THE WORK
2½ TONS PER SQUARE INCH
STRONGER than with the FLAT PUNCH.
Can be used in any Punching Machine, by license from the patentee.
D. L. KENNEDY,
10 Cortlandt St., New York.
CAUTION.—Infringements will be rigorously prosecuted.

Loose Pulley Lubricator.
Sectional View.



The only reliable automatic Loose Pulley Oiler in the World.
Saves Oil, Belting, Machinery, Time, soiling of Fabrics, &c., &c.
Will run from one to three months with once filling. Gives general satisfaction.
For illustrated description see April issue of American Machinist, 1879, or send for circular. Address
Loose Pulley Lubricator Mf'g Co.
P. O. Box 1030.
MIDDLETOWN, CT.

ENGRAVING ON WOOD
D. H. TUTTLE
5
BEEKMAN ST.
N.Y.
Mechanical work a Specialty.

The Goulds Manufacturing Co.
Manufacturers of all kinds of
Force and Lift PUMPS
For Cisterns, Wells, Railroads, Steamboats, Windmills, etc.
FIRE ENGINES,
Hydraulic Rams,
AMALGAM BELLS
For Churches, Schools, and Plantations.
Corn-Shellers, Sinks, etc.
Pumps and Materials for Driven Wells a specialty.
Satisfaction guaranteed.
Catalogues furnished upon application.

INQUIRE FOR GOULDS PUMPS
FACTORY, SENECA FALLS, N. Y.
WAREHOUSE, 15 PARK PLACE, NEW YORK CITY.

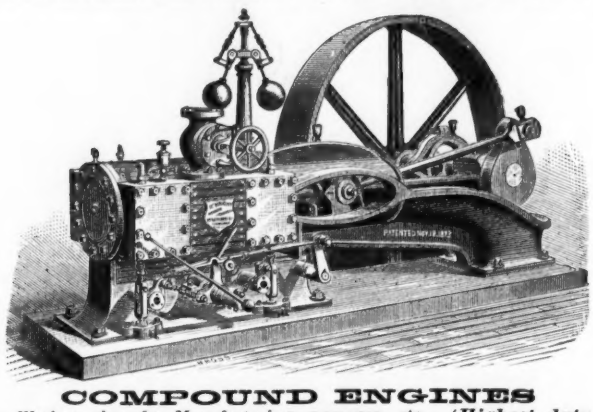
IMPROVED
Anti-Incrustation Liquid,
For the Prevention and Removal of
SCALE IN STEAM BOILERS.
Is purely a liquid, free from sediment, contains no acid, and is absolutely safe and effective.
Prof. H. G. Torrey, of the U. S. Assay Office, says: "Downer's Improved Boiler Liquid is free from all injurious substances, and well adapted to accomplish the object sought; know of nothing better and highly recommend it."
Circulars and references on application.
A. H. DOWNER,
PROPRIETOR AND SOLE MANUFACTURER,
17 Peck Slip, - New York.

Patent Automatic Cut-off Steam Engine.

WM. WRIGHT,

PATENTEE AND BUILDER, NEWBURGH, N. Y,

THE MOST ECONOMICAL IN THE USE OF FUEL, THE SIMPLEST IN CONSTRUCTION, AND ALTOGETHER THE BEST CUT-OFF ENGINE IN THE MARKET.



COMPOUND ENGINES

For City Water Works; also for Manufacturing purposes, etc. (*Highest duty guaranteed.*)

MARINE AND STATIONARY ENGINES.

STEAM BOILERS AND TANKS,

LIGHT AND HEAVY FORGINGS, SHAFTING, PULLEYS, HANGERS, MILL WORK, IRON AND BRASS CASTINGS, &c.

A LARGE GENERAL ASSORTMENT OF PATTERNS ON HAND.

SIZES and PRICES.

VERTICAL.

NAME.	Horse Power.	PRICE.
Mercury	10	$250
Queen	15	275
Monarch	20	325
Vulcan	30	400
HORIZONTAL		
Meteor	10	$225
Reliable	20	275
Hercules	30	375

A NEW DEPARTURE.

VERTICAL AND HORIZONTAL ENGINES AND YACHT ENGINES

OF FROM 10 TO 30 H. P.

At a Reduction of Fifty Per Cent. from Former Prices.

BEST MATERIAL. BEST WORKMANSHIP. LOWEST PRICES.

Manufactured by HEALD, SISCO & CO., Baldwinsville, N. Y.

Send for new Illustrated Circular, giving full description, and convincing testimonials, of which the following is a specimen:

U. S. ENGINEER'S OFFICE, PITTSBURGH, Pa., July 23, 1879.

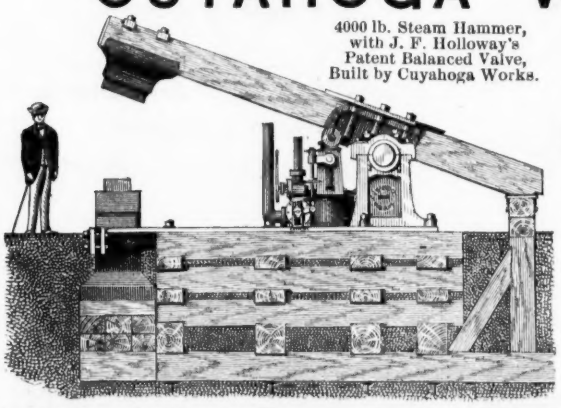
Messrs. HEALD, SISCO & Co., Baldwinsville, N. Y.

Gentlemen:—In reply to your letter of the 19th instant, I have to say that we have had one of your "Reliable" horizontal engines at work since the middle of October, 1878, up to the present time. It has been used for driving one of your No. 10 Centrifugal Vertical Pumps, and has given us entire satisfaction. The only repairs necessary has been the replacing of the piston packing once.

Yours truly, T. A. MAHAN, 1st Lieut. Engineers.

[We desire to call particular attention to the above letter, as since it was received by us, Lieut. Mahan has confirmed his good opinion of our Engines therein expressed, by ordering two more of them.]

CUYAHOGA WORKS



4000 lb. Steam Hammer, with J. F. Holloway's Patent Balanced Valve, Built by Cuyahoga Works.

Manufacturers

LAND

AND

MARINE ENGINES,

BLAST FURNACE

Machinery,

STEAM

Hammers

Send for Circulars.

Cleveland, Ohio, U. S. A.

LATHE ATTACHMENTS

FOR MILLING,

Plane and Irregular Forms.

Taps and Reamers Fluted and Gears cut without removing from the lathe centers.

See American Machinist, Sept. 13 and 20.

For circular address WM. MAIN, Piermont, N. Y.

JOHN FISH, M. E.

145 Broadway, Room 33,

(Of the Pneumatic Tramway Co.) New York City.

Special attention given to Designing and Superintending the Construction of Improved Machinery.

Hoisting Engines, Air Compressors, and Pneumatic Motors a Specialty.

Working Drawings and Plans, Specifications and Estimates furnished.

STEEL CASTINGS

FROM 1-4 TO 10,000 lbs. WEIGHT.

True to pattern, sound and solid, of unequaled strength, toughness and durability.

An invaluable substitute for forgings or cast iron requiring three-fold strength.

Gearing of all kinds, Shoes, Dies, Hammerheads, Crossheads for Locomotives, etc.

12,000 Crank Shafts of this steel now running proved superior to wrought iron.

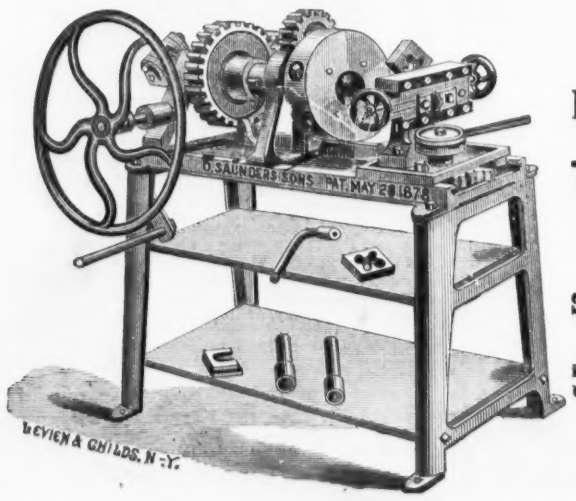
CRANK SHAFTS, CROSSHEADS and GEARING specialties.

Circulars and Price Lists free. Address

CHESTER STEEL CASTINGS CO.

Formerly McHaffie Direct Steel Castings Co.

Works, CHESTER, Pa. 407 Library St., PHILADELPHIA.



D. SAUNDERS' SONS

New Pipe-Threading Machine

The I.X.L.

FOR HAND OR POWER.

Manufacturers of

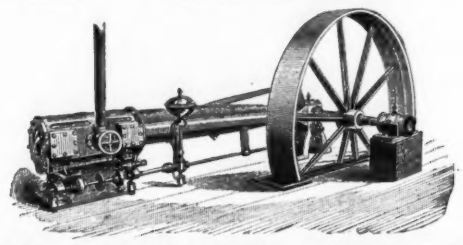
Steam & Gas Fitters' Tools.

Pipe Cutting and Threading Machines for Pipe Mill Use, &c., a Specialty.

YONKERS, N. Y.

SEND FOR CIRCULARS.

The "Brown" Automatic CUT-OFF ENGINE.



UNEXCELLED FOR WORKMANSHIP, ECONOMY & DURABILITY.

WRITE FOR PRICES AND INFORMATION.

C. H. BROWN & CO., Sole Manufacturers,

FITCHBURG, MASS.

THE

LAWRENCE ENGINE,

A FIRST-CLASS AUTOMATIC CUT-OFF STATIONARY

ENGINE.

Highest Economy. Best Workmanship at a Moderate Price.

ARMINGTON & SIMS, - LAWRENCE, Mass.

JARVIS PATENT FURNACE

FOR SETTING

STEAM BOILERS.

MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION AWARDED AT THE THIRTEENTH EXHIBITION 1878

Economy of Fuel, with increased capacity of Steam Power.

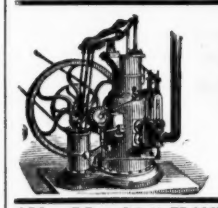
The same principle as the SIEMENS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire.

Will burn all kinds of waste fuel without a blast. including screenings, wet peat, wet hops, sawdust, log-wood chips, horse manure, &c.

A. F. UPTON, General Agent.

Also Agent for the Mahony Patent Corrugated Grates, with 50 per cent. air space.

Send for Circular. *P. O. BOX 3401, BOSTON, MASS.*



AIR ENGINES. NO WATER. NO ENGINEER.

No Extra Insurance! Absolutely Safe! Simple! Reliable! Durable!

Most Convenient and Economical Power Known.

SHERRILL ROPER AIR ENGINE CO.

Manufacturers of Air Engines, Elevators and Hoisting Machinery.

91 & 93 Washington St., N. Y.

W. H. HOFFMAN, M. E.,

PASSAIC, New Jersey.

Designer and Constructor of

Hawser and Rope Machinery

Working Drawings of Engines, Boilers, Machinists' and Boiler Makers' Tools.

Betts Machine Co.

WILMINGTON, DEL.

Have on hand a large lot of

NEW AND SECOND HAND

Machine Tools.

WHITTIER MACHINE CO.

MANUFACTURERS OF

STEEL BOILERS,

Steam Engines and Elevators,

Boston, Mass.: Works, 1176 Tremont St.

N. Y. Office, 120 Broadway.

STEELINE.

Used for refining and tempering all kinds of Steel Tools.

Increases their durability at least five-fold.

Secures absolute safety from cracking.

Send for Circular to

BAUER & CO., 96 Greenwich Ave., N. Y.

THE

Waters' Perfect Governor,

WITH AUTOMATIC SAFETY STOP, ADJUSTABLE SPEED, SOLID COMPOSITION VALVES AND SEATS.

EVERY GOVERNOR IS WARRANTED.

WILLIAM COOKE,

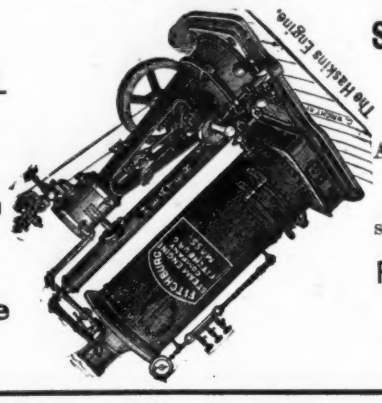
(Successor to COOKE & BEGGS),

AGENT.

6 Cortlandt Street, - New York, N. Y.

A FULL LINE ALWAYS IN STOCK.

HORIZONTAL.
VERTICAL
Automatic Cut-off
ENGINES.
Yacht Engines,
Semi-Portable Engines.



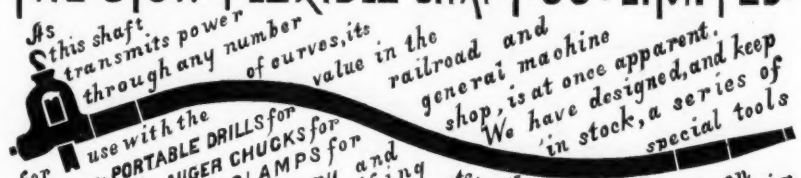
STEEL AND IRON BOILERS.

All sizes to 225 horse-power.

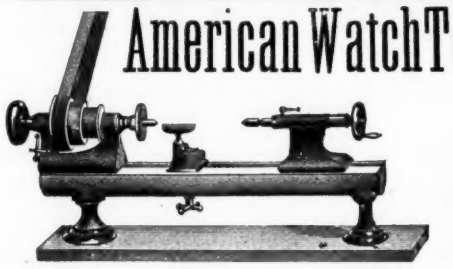
Send for pamphlet and say where you saw this.

FITCHBURG STEAM ENGINE CO.
Fitchburg, Mass.

THE·STOW·FLEXIBLE·SHAFT·CO·LIMITED.


As this shaft transmits power through any number of curves, its value in the railroad and general machine shop, is at once apparent. We have designed, and keep in stock, a series of special tools for use with the shaft, as:-PORTABLE DRILLS for metals; AUGER CHUCKS for wood; CLAMPS for emery and buffing wheels, etc.
CATALOGUE and PRICE LIST, on application.

500·NORTH·FIFTEENTH·ST·PHILADELPHIA.



American Watch Tool Co., Waltham, Mass.

MANUFACTURERS OF

MACHINERY

FOR

Watch and Clock Making,

AND

Special Tools and Machinery of all kinds.

The accompanying cut shows our No. 3, or Machinist Bench Lathe. This lathe was originally designed for the American Watch Co., and has been adopted by all American watch companies and by many clock companies of this country, and watch companies of England and Switzerland. All agree in pronouncing it the best lathe for small work ever made.

H. L. STELLWAGEN, Mechanical Engineer,

254 N. 5th St., Philadelphia.

A PRACTICAL TREATISE
ON THE
COMBUSTION OF COAL,
Including Descriptions of various Mechanical Devices, for the Economic Generation of Heat by the Combustion of Fuel, whether SOLID, LIQUID, OR GASEOUS.
BY
WILLIAM M. BARR.
1 Vol., large 8vo., illustrated.
Price, Extra Cloth, - - - - - $2.50
" Half Morocco, - - - - 3.50
Sent, postage paid, to any part of the United States upon receipt of the price. Address
JOHN BROTHERS, Publishers, Indianapolis, Ind.

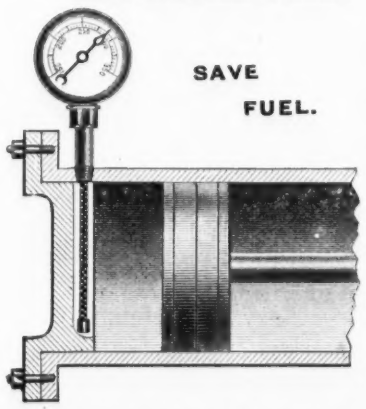
THE CROWNING CULMINATION!

ENGINEERS, MECHANICS, Mill Owners, Miners, Merchants, &c., will find in **Moore's "Universal Assistant & Complete Mechanic,"** a work containing 1016 pages, 500 Engravings, 461 Tables, and over **1,000,000** Industrial Facts, Calculations, Processes, Secrets, Rules, &c., of rare utility in 200 Trades. A **$5** book free by mail for **$2.50,** worth its weight in gold to any Mechanic, Farmer, or Business Man. *Agents Wanted.* One Agent reports 41 sales in 2 days, another 29 sales in ¾ day; another 27 sales in 2 hours. For Ill. Pamphlet send stamp to **R. Moore, No. 20** Cooper Inst., N. Y.

GEO. C. TRACY & CO
Counselors at Patent Law
EUCLID AVE. BLOCK,
CLEVELAND, O.

Before doing anything in regard to Patents, send for our 140 page book, **"ALL ABOUT PATENTS,"** mailed free.

STEAM ENGINE ECONOMY.
The DIXWELL IMPROVEMENTS
FOR WORKING ENGINES WITH SUPERHEATED STEAM.



SAVE FUEL.

PREVENT CYLINDER CONDENSATION.

APPLICABLE TO ANY ENGINE.

GEO. H. BARRUS, Agent,
Office, 553 Shawmut Avenue, - BOSTON.

On exhibition at the American Institute Fair with the Buckeye Engine. Estimates furnished on application. Address, during the Fair, 206 West 53d Street, New York.

A. J. WILKINSON & CO.
186 & 188 Washington Street,
BOSTON, MASS.
Machinists' Tools & Supplies,
CUT BRASS GEARS.
CATALOGUES FREE.

SECOND-HAND

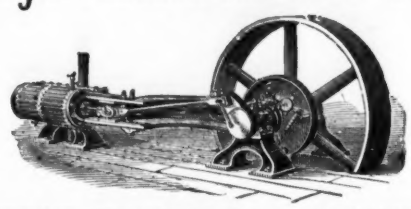
Machinists' Tools.

One 23 x 48 in. **Corliss Engine.**
One Engine Lathe, 30 in. x 20 ft. Good order.
One Engine Lathe, 30 in. x 16 ft.. Wheeler, new.
One " " 26 in. x 14 ft. " "
One " " 26 in. x 13 ft., very heavy.
One " " 22 in. x 21 ft., for shafting, Wh'ler.
Three " " 20 in. x 6 ft. Wheeler.
One " " 19 in. x 7 ft. Whitcomb.
Two " " 15 in. x 6 ft. Lathe & Morse.
One " " 15 in. x 6 ft. Flather, new, with Turret Head.
One " " 24 in. x12 ft. Not Screw Cutting.
One " " 16 in. x 10 ft. Not Screw Cutting.
Six " " 12 in. x 4 ft. Not Screw Cutting.
One large Chucking Lathe and Chuck.
One Hand Lathe, 18 in. x 4½ ft.
Two " " 20 in. x 8 ft.
12 " " 11 in. x 4½ ft. New Spencer.
Six " " 7 in. x 2½ ft. " "
One Planer, 30 in. x 6ft. Wheeler.
One " 22 in. x 5 ft. " New.
One Crank Planer, 24 in. stroke.
One 8 in. stroke Shaper. Gould.
One 8 in. " " " Pratt & Whitney.
One Brown & Sharpe Universal Milling Machine.
One No. 3 Garvin Milling Machine.
One Garvin Cutter Grinder. New.
One Combined Cutter and Reamer Grinder, with Threading Tool Grinder attached. New.
One 27 in. Swing Upright Drill. New Bk. Geared and Self-feed.
One 24 in. " " " P. & W. Self-feed.
One 10 in. " " " Blaisdell.
One Gear Cutter.
One each No. 0 P. & W. 2 and 3 Spindle Drills.
One each No. 1 P. & W. 3 and No. 2, 4 Spindle Drills.
Three Sensitive Drills, drills to 3-16 in. hole.
One No. 1 Brown & Sharpe Screw Machine Chasing Bar.
One No. 4 Stile's Punch Press.
One No. 1 Wilder Punch Press. New.
One No. 4 " " " Geared. New.
One No. 6 " Shear. Geared.
One 10 H. P. Baxter Engine.
Seven Stephens' Vises.
Belting, Shafting and Miscellaneous Machinery.

E. P. BULLARD,

14 Dey Street, New York.

The Buckeye Automatic Cut-off Engine.



Estimates Furnished on Application.

BUCKEYE ENGINE CO.

Room 42, Coal and Iron Exchange, New York.

HILL, CLARKE & CO., - - - 36 & 38 Oliver Street, Boston.

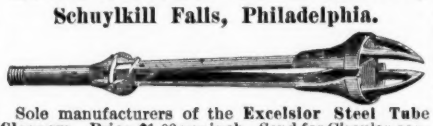
The George Place Machinery Agency

Offer for sale all the second-hand tools of the Wood & Light Machine Co., at their Works; also a number of new tools made by them at very low prices; also a large assortment of new and second-hand tools and machinery in stock. SEND FOR A LIST.

The George Place Machinery Agency,

121 Chambers & 103 Reade Sts., New York.

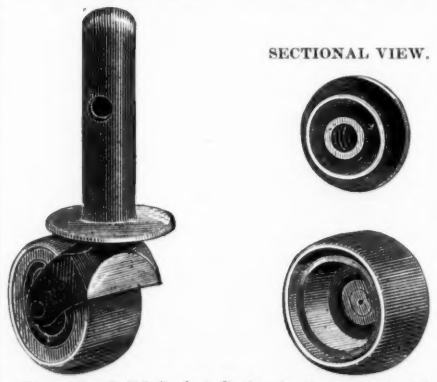
RUFFNER & DUNN,
Schuylkill Falls, Philadelphia.



Sole manufacturers of the **Excelsior Steel Tube Cleaners.** Price, $1.00 per inch. Send for Circular containing names of users who consider it indispensable

---

GEORGE P. CLARK,
Manufacturer of the Patent
RUBBER CASTOR.



The only Solid Socket Castor in the market. No more noise. No more marking of inlaid floors. Save your carpets by using the Rubber Castor. Warranted perfect in action. Also one of the best non-conductors for Rheumatism. Want to be used to be appreciated. Once tried always liked.

GEORGE P. CLARK, Windsor Locks, Ct.

CHARLES MURRAY
ENGRAVER ON WOOD.
No. 58 ANN ST.
NEW YORK.

ENGINEERS.

THE RIGHT MEN IN THE RIGHT PLACES

Having posted ourselves in the specialties of all well known Engineers and Chemists, and having made favorable contracts with many, we are prepared to supply their services.

For designing, constructing and testing machinery and fitting up factories.
For Hydraulic Works.
For Bridge Building.
For Mining Work of all kinds.
For Blast Furnace Building and Metallurgical Operations.
For Sanitary Engineering.
For Surveys. For Railroads.
For Reports on New Inventions for Capitalists.
For Analyses and Assays.
For Expert Testimony in Law Suits.
For Professional Advice generally.

THE BEST TALENT AT MODERATE COST.
Park Benjamin's Scientific Expert Office,
37 Park Row, New York.

SAM. TRO. SMITH,
COUNSELLOR AT LAW,
AND
Advocate in Patent Cases.
NOTARY PUBLIC.
21 PARK ROW, - NEW YORK.

Top Floor—Take Elevator.

WORCESTER BOILER WORKS,
MANUFACTURERS OF THE
"VICTOR"
Feed-Water-Heater and Purifier.

Write for Prices and further information.

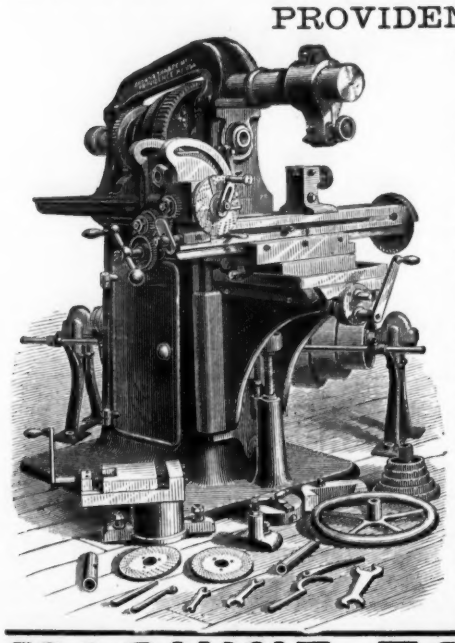
For Heating and Purifying Water for Steam Boilers.

(Jones' Patent, Nov. 6, 1877.)

WM. ALLEN & SONS.
WORCESTER, MASS.

BROWN & SHARPE M'F'G CO.

PROVIDENCE, R. I.



MANUFACTURERS OF THE

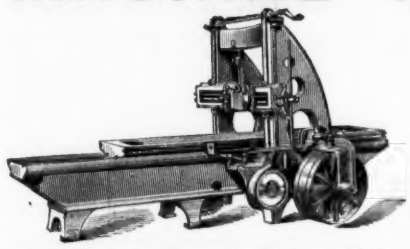
UNIVERSAL Milling Machine

This Machine has been designed especially to meet the wants of Steam Engine and Locomotive builders, and others engaged in the manufacture of heavy machinery and tools.

The essential features and motions are the same as in our smaller Universal Milling Machine, with such enlargement of the whole machine and its parts as would best adapt it for the class of work to be done. The cone has three diameters, each 3¼ inches face. In addition, the cone is strongly geared, thus making six changes of speed. There are, also, the same number of changes of feed. The spindle boxes are of hardened cast steel, and, together with the spindle bearings, are carefully ground, and are provided with means of compensation for wear. The spindle will carry a cutter arbor projecting 15 inches, which is supported by an adjustable center at the outer end. Cutters of 8 inches or less diameter can be used. The horizontal movement of the spiral clamp bed upon the knee, in a line with the spindle of the machine, is 6½ inches, and the vertical movement of the spiral bed centers below the spindle centers is 11 inches. The spiral bed can be set at angles of 35° each way from center line of spindle, and can be fed automatically 22 inches, taking also 22 inches between the centers, and will swing 11½ inches.

☞ Illustrated Catalogue sent per mail on application.

MACHINE TOOL WORKS,



FORMERLY

FERRIS & MILES,

Twenty-fourth and Wood Streets

(Take Arch or Vine Street Car),

FRED'K B. MILES, Engineer. PHILADELPHIA

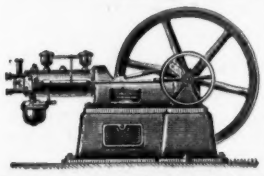
MACHINE TOOLS, STEAM HAMMERS, &c.

Having introduced many novel and valuable improvements into the construction of **SHAPING, SLOTTING, BORING** and **PLANING MACHINES**, as well as **Lathes** and **Drills**, we are now prepared to furnish these machines in greater perfection than ever before. By means of our improved devices the operations of turning, drilling, boring, planing and shaping, or slotting, can all be performed with a great saving of time and labor. It will be found worth any purchaser's while to examine our new methods of screw cutting, feed-gearing and convenient arrangements and attachments for enabling work to be done with the least possible expenditure. We would direct special attention to our new **4 FT. RADIAL DRILL**, with **6 Automatic Feeds, 10 IN. STROKE SHAPING MACHINES, 17 IN. SQUARE PLANING MACHINES** and **PATENT SCREW CUTTING LATHES**, which cut 16 threads and give **16 feeds without changing gears. Send for Catalogue.**

FRED'K B. MILES.

NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.



STARTED INSTANTLY BY A MATCH, IT GIVES FULL POWER IMMEDIATELY.

WHEN STOPPED, ALL EXPENSE CEASES.

No Explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running. Recommended by Insurance Companies.

UNSURPASSED IN EVERY RESPECT for Hoisting in Warehouses, Printing, Ventilating, Running small Shops, etc.

2, 4 and 7 H. P. and upwards. Built by

SCHLEICHER, SCHUMM & CO., 3045 Chestnut St., Philadelphia.

Boston Agency, HILL, CLARKE & CO., 36 & 38 Oliver Street.

STEAM Pumping Machinery

For Feeding Steam Boilers, Filling Reservoirs and Tanks, and for General Pumping.

SEND FOR CATALOGUE

Illustrating every variety of

STEAM PUMPING MACHINERY.

Cope & Maxwell M'f'g Co.

HAMILTON, OHIO.

Machines at reduced prices, and Wheels *Guaranteed*

LEHIGH VALLEY EMERY WHEEL CO.

Send for our new Illustrated Catalogue

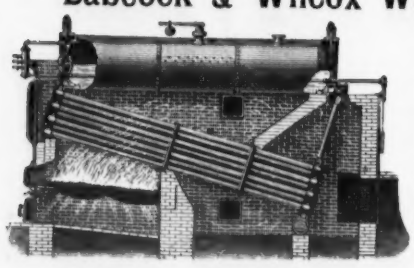
Weissport, Penn.

GEO. W. FIFIELD, manufacturer of **ENGINE LATHES** from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. **LOWELL, MASS., U. S. A.**

JAMES W. SEE, Consulting Engineer,

HAMILTON, OHIO.

Babcock & Wilcox Water-Tube Steam Boiler,



Over 40,000 Horse-Power Now in Use. Adapted for all purposes. Safety from Explosions.

In sections easy of transportation. No bolted, screwed or packed joints. All joints made by expanding wrought iron tubes into bored holes. Can be erected or repaired by ordinary mechanic. Easily cleaned from soot or sediment. Adapted to all kinds of fuel. Steady water line and dry steam. No leaks from unequal expansion. Rapid steaming. Highest attainable economy. Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

Illustrated Circulars and other desired information promptly furnished.

BABCOCK & WILCOX, Engineers, 30 Cortlandt St., New York.

THE PRATT & WHITNEY CO.

HARTFORD, CONN., U. S. A.

MAKE SPECIALTIES OF

Drop Hammers,

PUNCHING PRESSES,

HAND DRILLING MACHINES, RATCHET DRILLS, COMBINATION LATHE CHUCKS, CUTTERS FOR TEETH OF GEAR WHEELS, SCREW PLATES, HAND, MACHINE NUT AND PIPE TAPS, AND BOLT CUTTERS,

In connection with their business of

MACHINISTS' TOOLS, GUN, SEWING MACHINE and Special Machinery, &c.

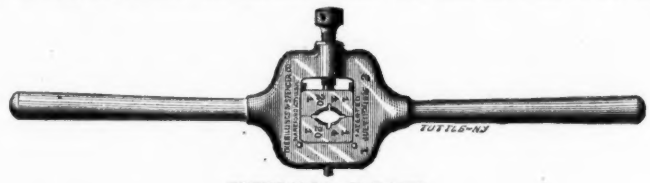
PRICE LISTS FURNISHED ON APPLICATION.

THE BILLINGS & SPENCER CO.

HARTFORD, CT., U. S. A.

Manufacturers of Billings' Patent Screw Plates in Four Sizes.

These Plates are Drop-forged from Siemens-Martin Steel. The Dies are made of the best Tool Ste



PRICE LIST.

No. 0.

With Dies and Tap, Cutting
1-8[48] 5-32[40] 3-16[32] 7-32[24] 1-4[20].....$5.25
The same, Nickel-plated, in Leather-covered Case, lined with Plush 6.50
Single pair of Dies, each..... .50

Machinists' or Blacksmiths' Taps furnished to correspond with Dies for Nos. 1, 2 and 3 Plates, at lowest market prices.

No. 1.

With 5 Pairs of Dies, Cutting
1-4[20] 5-16[18] 3-8[16] 7-16[14] 1-2[13].....$7.00

No. 2.

With 5 Pairs of Dies, Cutting
1-2[12] 9-16[12] 5-8[11] 11-16[11] 3-4[10].....$10.00

No. 3.

With 5 Pairs of Dies, Cutting
13-16[10] 7-8[9] 15-16[9] 1[8] 1,1-8[7]..... 15.00

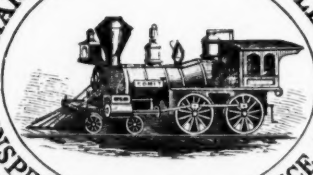
Single Pairs of Dies for No. 1 Plate, $1.00; No. 2 Plate, $1.50; No. 3 Plate, $2.00 each.

Different sizes and number threads furnished.

Special prices quoted on Whitworth or U. S. Standard Threads on application.

Steel and Iron Drop-forgings of every description for Guns, Pistols, Sewing Machines, Machinists' Tools and Machinery generally. Send for Illustrated Catalogue and Price List.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.



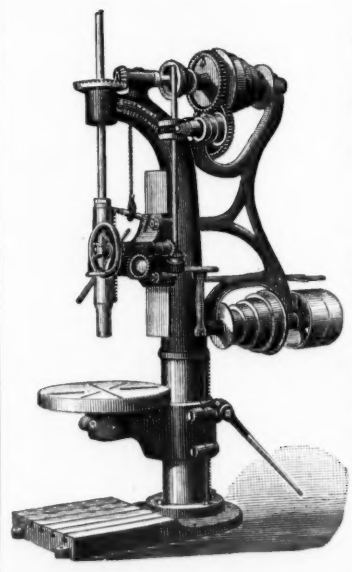
J. M. ALLEN, PRESIDENT.

W. B. FRANKLIN, VICE-PRESIDENT.

J. B. PIERCE, SECRETARY.

GEARS of all kinds and sizes. Send for list. Pattern and Model Making. Light Machine Work in general.

GEO. B. GRANT, 100 Beverly St., Boston, Mass.

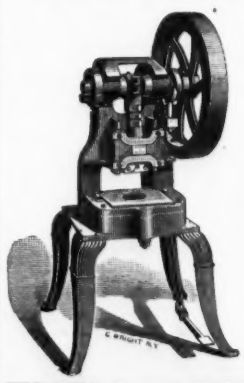


Engine Lathes, Planers, Drills, &c.

DAVID W. POND, WORCESTER, MASS.

Send for Catalogue of New Designs.

GOLD MEDAL AWARDED, PARIS EXPOSITION, 1878.



BLISS & WILLIAMS,

Plymouth, Pearl and John Streets,

BROOKLYN, N. Y.

Manufacturers of all kinds of

Presses, Dies and Special Machinery

FOR WORKING SHEET METALS, &c.

FRUIT AND OTHER CAN TOOLS.

J. M. CARPENTER PAWTUCKET, R.I.

Manufacturer of **TAPS AND DIES** of every description.

Also, for sale low, **UNITED STATES STANDARD GAUGES**, from ¼ to 3 inch.